

## On a collection of Cirripedia Thoracica from Madagascar and adjacent waters

by Xianqiu REN

**Abstract.** — Thoracic Cirripeds collected in the Madagascar waters by Alain CROSNIER include 28 species belonging to three suborders and nine families. Six species are described as new and six others are recorded for the first time from this part of the Indian Ocean.

**Résumé.** — Les Cirripèdes Thoraciques recueillis dans les eaux malgaches par Alain CROSNIER comprennent 28 espèces appartenant à trois sous-ordres et neuf familles. Six d'entre elles sont décrites comme nouvelles et six autres signalées pour la première fois de cette partie de l'océan Indien.

Xianqiu REN, *Institute of Oceanology, Academia Sinica, 7 Nan-Hai Road, Qingdao, China.*

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The present paper is a report on a study of the Cirripedia Thoracica (Crustacea) collected from Madagascar and the adjacent seas by Dr. Alain CROSNIER of the Institut français de Recherches Scientifiques pour le Développement en Coopération (ORSTOM) during the period of 1956-1975. The localities of the collection range from the intertidal zone to a depth of about 2000 m, mainly from the continental shelf. Twenty-eight species belonging to three suborders and nine families are identified, of which six species are new and six others recorded for the first time from waters off Madagascar.

The type materials are deposited in Laboratoire de Zoologie (Arthropodes), Muséum national d'Histoire naturelle, Paris (MNHN), and Department of Invertebrate Zoology, Institute of Oceanology, Academia Sinica, Qingdao, China (IOAS).

The author is much indebted to Dr. Alain CROSNIER, ORSTOM, Paris, for his kindness in providing this collection for study, and also to Prof. J. Y. LIU, Institute of Oceanology, Academia Sinica, and Dr. B. FOSTER, the University of Auckland, for reading the manuscript.

### LIST OF THE SPECIES IDENTIFIED

1. *Calantica flagellata* sp. n.
2. *Euscalpellum triflagellum* sp. n.
3. *Neoscalpellum crosnieri* sp. n.
4. *Annandaleum gruvelii* (Annandale, 1906)
- \*5. *Pilsbryiscalpellum condensum* (Nilsson-Cantell, 1921)
6. *Anguloscalpellum quadrihamulum* sp. n.

7. *Trianguloscalpellum michelottianum* (Seguenza, 1876)
8. *Lepas anatifera anatifera* Linnaeus, 1758
9. *Lepas indica* Annandale, 1909
10. *Conchoderma auritum* (Linnaeus, 1767)
11. *Conchoderma virgata* (Spengler, 1790)
12. *Conchoderma hunteri* (Owen, 1830)
13. *Temnaspis amygdalum* (Aurivillius, 1894)
14. *Megalasma (Glyptelasma) annandalei* Pilsbry, 1907
- \*15. *Ibla cuningi* Darwin, 1851
- \*16. *Paralepas nodulosa* (Broch, 1922)
17. *Verruca (Metaverruca) sculpta* Aurivillius, 1898
18. *Verruca (Rostratoverruca) sewelli* Stubbings, 1936
19. *Tetraclita africana* sp. n.
20. *Chirona amaryllis* (Darwin, 1854)
21. *Chirona tenuis* (Hoek, 1883)
22. *Solidobalanus ciliatus* (Hoek, 1913)
- \*23. *Acasta crassa* Broch, 1931
24. *Acasta madagascariensis* sp. n.
25. *Balanus amphitrite amphitrite* Darwin, 1854
- \*26. *Balanus rhizophorae* Ren and Liu, nom. nov.
27. *Megabalanus tintinnabulum tintinnabulum* (Linnaeus, 1758)
- \*28. *Megabalanus volcano* (Pilsbry, 1916)

Those marked with an asterisk are recorded for the first time from Madagascar waters.

### SYSTEMATIC ACCOUNT

Suborder LEPADOMORPHA Pilsbry, 1907

Family SCALPELLIDAE Pilsbry, 1916

Subfamily CALANTICINAE Zevina, 1978

Genus CALANTICA Gray, 1825

1. *Calantica flagellata* sp. n.

(Fig. 1)

HOLOTYPE : Ci 2051, MNHN, Paris. Capitulum : length 10 mm, width 5 mm; peduncle : length 5.6 mm, width 4.0 mm. Madagascar, 12°42.4' S, 48°14.3' E. Depth 285-295 m. Attached on *Euscalpellum triflagellum* sp. n. 15.11.1972

PARATYPES : Ci 2052, MNHN, Paris. 3 small specimens (1 kept at IOAS). Madagascar, 12°43' S, 48°15' E. Depth 360-348 m. Attached on *Euscalpellum triflagellum* sp. n. 14.04.1971.

### DESCRIPTION

Female-capitulum oblong, covered by transparent, hirsute cuticle, with 15 calcified plates. Scutum triangular, large, apex projecting beyond occludent margin of tergum, occludent and tergal margins straight; basal margin strongly arched. Tergum rhombiform, large, upper part of carinal margin about as long as occludent margin. Carina straight, strongly or slightly bowed, umbo at apex; apex strongly projecting beyond carinal margin of tergum; roof slightly concave, smooth, two lateral ribs low. Upper latus large, height greater than width, umbo at apex, scutal margin strongly hollowed out, carinal margin slightly arched, basal margin straight, lower angle almost parallel. Rostrum large, triangular, apex not projecting. Rostral latus smaller than carinal latus, both triangular. Inframedian latus about same size and shape as rostral latus. Subcarina largest of valves in lower whorl, triangular, apex pointed outwards.

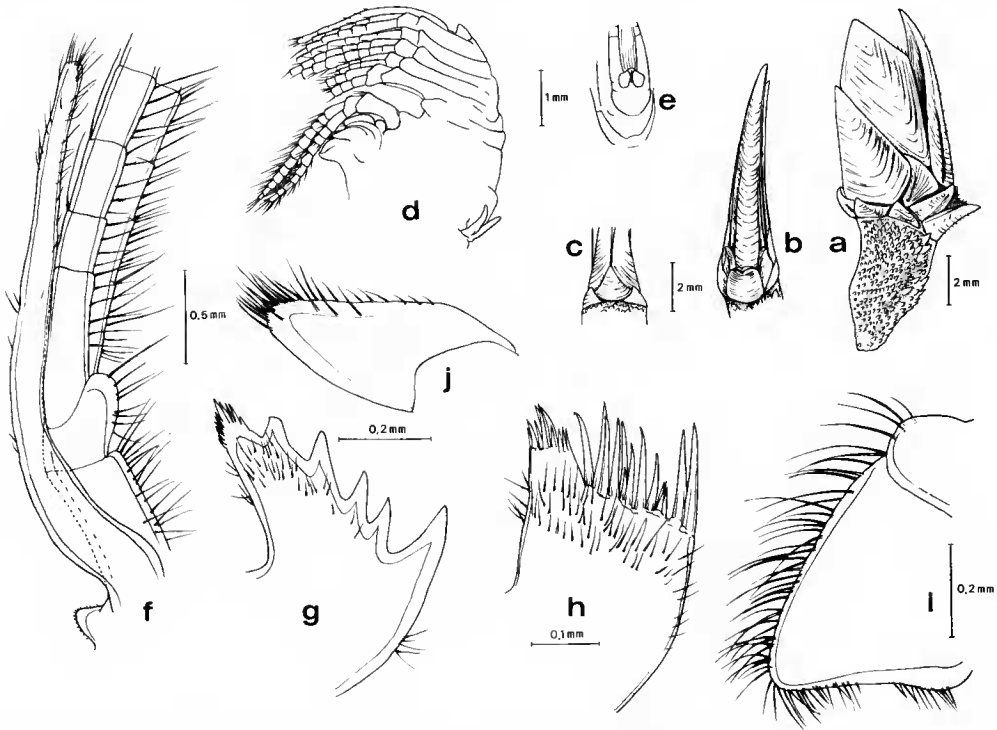


FIG. 1. — *Calantica flagellata* sp. n. : a, individual viewed from right side; b, carinal view; c, rostral view; d, soft body; e, caudal appendage; f, penis and basal part of cirrus VI; g, mandible; h, maxilla I; i, maxilla II; j, palp.

Peduncle short, with small calcified scales, which are bluntly conical papillae.

Filamentary appendages short on posterior part of dorsal surface of prosoma.

Labrum bullate, forwardly prolonged; crest armed with small denticles. Mandible with 5 teeth, inferior angle acute, pectinate. Mandibular palp small, conical, with spines on its superior and anterior margins. Maxilla I with indistinct notch on cutting edge, above which

are two large spines and below 3 small and 9 medium sized spines; inferior angle projects beyond cutting edge, with 10 small spines. Maxilla II triangular, with setae and short maxillary lobe.

Numbers of segments of rami of cirri I-IV of holotype as follows :

I	II	III	IV	V	VI
10    12	18    20	20    19	21    20	20    21	20    20

Cirrus I widely separated from cirrus II, anterior ramus slightly shorter than posterior. Anterior and posterior rami of other cirri about equal in length, each of intermediary segments bears 4-5 pairs of setae on anterior margin.

Caudal appendage uniarticulate, short and oval, with short setae. Penis long, with setae, reaching to sixth segment of cirrus VI. Complemental male not known.

#### REMARKS

The present species is closely allied to *Calantica pollicipedoides* (Hoek) in the shape of the capitulum, but may be distinguished by the following characters : ocludent margin of scutum straight; apices of upper, rostral, carinal, inframedian latus and rostrum not projecting beyond the surface of capitulum; roof of carina not transversally hollowed out; pair of filamentary appendages on the dorsal surface of the prosoma; inferior angle of maxilla I projecting beyond the cutting edge; penis longer.

### Genus *EUSCALPELLUM* Hoek, 1907

#### 2. *Euscalpellum triflagellum* sp. n.

(Fig. 2)

**HOLOTYPE** : Ci 2053, MNHN, Paris. Capitulum : length 22.2 mm, width 12.7 mm. Peduncle : length 13.7 mm, width 5.5 mm. Madagascar, 12°37.5' S, 48°16.0' E. Depth 355-370 m. Attached on hydroid polyp. 18.01.1971.

**PARATYPES** : Ci 2054, MNHN, Paris. 2 small specimens. Locality same as the holotype. Ci 2055, MNHN, Paris. 28 specimens (2 kept at IOAS). Madagascar, 12°43.0' S, 48°15' E. Depth 348-360 m. Attached on calcitic tube of Serpulidae. 14.04.1971.

**OTHER MATERIALS EXAMINED** : Ci 2057, MNHN, Paris. 2 specimens. Madagascar, 12°43' S, 49°15.5' E. Depth 290-295 m. 18.01.1972. — Ci 2058, MNHN, Paris. 15 specimens. Madagascar, 12°42.4' S, 48°14.3' E. Depth 285-295 m. Attached on calcitic tube of Serpulidae. 15.09.1972. — Ci 2059, MNHN, Paris. 16 specimens. Madagascar. 18°54.0' S, 43°55.0' E. Depth 310-380 m. Attached on calcitic club. 24.11.1973.

#### DESCRIPTION

Female-capitulum narrow, elongate, laterally compressed, with slightly separate, fully calcified plates, covered by a transparent yellowish membrane; all plates with apical umbo.

Scutum larger, occludent and tergal margins straight, umbo at apex. Tergum largest, triangular or rhomboidal; carinal and basal margins slightly convex. Carina arched, dorsal surface convex, rib-form costata, both sides slightly longitudinally hollowed, umbo at apex, borders narrow. Upper latus quadrilateral, umbo often subapical. Rostral latus and carinal latus small, triangular. Inframedian latus large, quadrangular. Rostrum large, rhomboidal, broadest below middle; surface longitudinally costate, both sides slightly hollowed. Subcarina equilaterally triangular, placed at basal margin of carina.

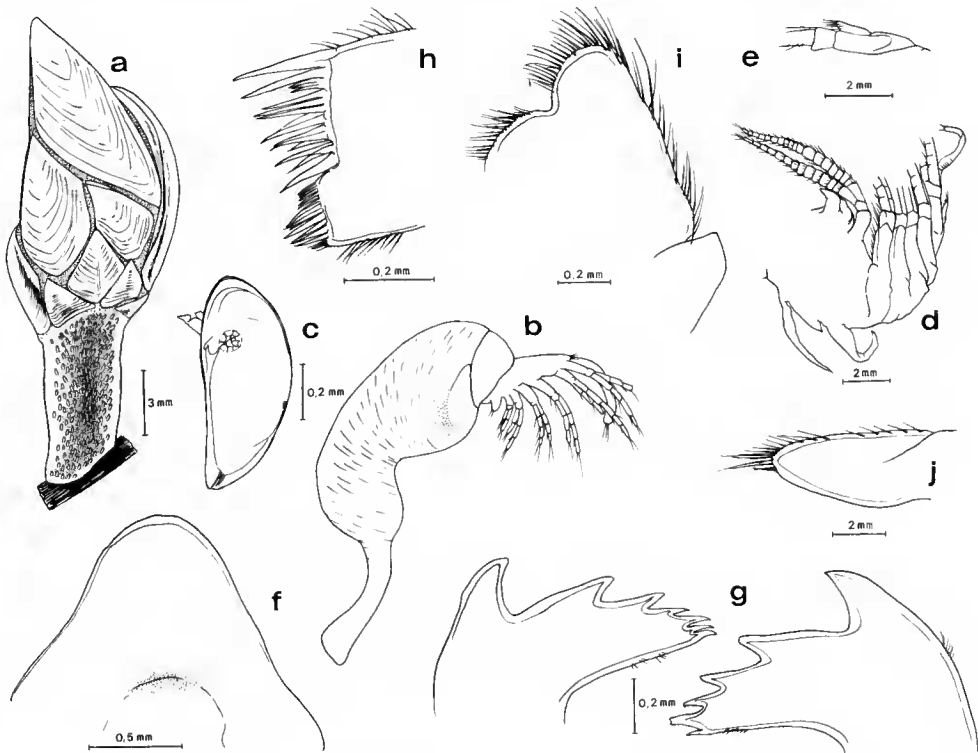


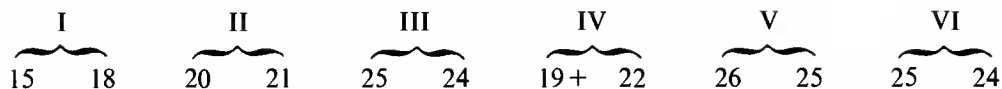
FIG. 2. — *Euscalpellum triflagellum* sp. n.: a, individual viewed from right side; b, complementary male; c, cypris larva; d, soft body; e, caudal appendage and basal part of cirrus VI; f, labrum; g, mandible; h, maxilla I; i, maxilla II; j, palp.

Peduncle short, cylindrical, with many small regularly arranged calcified scales.

Dorsal surface of prosoma with 3 filamentary appendages; anterior and posterior flagelliform, middle one conical.

Labrum bullate, anterior portion projecting, crest with numerous irregularly arranged small teeth. Mandible usually with 5 teeth, inferior angle with 1-2 teeth. Maxilla I with lower part of cutting edge very prominent, with group of shorter and group of longer spines; on upper half, notch obsolete, with 2 large and 13-14 medial spines. Maxilla II with distinct non-setose notch on frontal portion, maxillar lobe short. Palp small, conical, with setae.

Numbers of segments of cirri I-VI of paratype as follows :



Cirrus I slender, anterior ramus slightly shorter than posterior. Anterior and posterior rami of cirrus II-VI subequal in length, each of intermediate segment bears 6-7 pairs of setae on anterior margin.

Caudal appendage uniarticulate, oval, with terminal setae.

Penis relatively short with scattered soft setae.

Complemental males were found on lower part of occludent margin of both scuta. Body resembles an heteralepadid, with capitulum and peduncle. Capitulum : length 1.0 mm, width 0.4 mm, sac-shaped, outer surface with horizontal streaks; scutum imperfectly calcified, indistinctly triangular, without other plates; body with mouth parts, cirri and penis. Peduncle short, slender, length 0.4 mm, width 0.08 mm.

Cypris larve attached on lower part of occludent margin,  $0.7 \times 0.3$  mm in size.

#### REMARKS

This new species is very similar to *Euscalpellum stratum* (Aurivillius) in its general features, but may easily be distinguished from the latter by the 3 filamentary appendages on the dorsal surface of the prosoma, the shape and numbers of which are unchanged in all specimens, and by the umbo of the carina situated at the apex, and the mandible with 5 teeth.

Subfamily MEROSCALPELLINAE Zevina, 1978

Genus NEOSCALPELLUM Pilsbry, 1907

#### 3. *Neoscalpellum crosnieri* sp. n.

(Fig. 3)

HOLOTYPE : Ci 2060, MNHN, Paris. Capitulum : length 21.7 mm, width 10.3 mm; peduncle : length 9.3 mm, width 4.3 mm. Madagascar, 17°50' S, 43°07' E. Depth 1475-1530 m. Together with *Trianguloscalpellum michelottianum* (Seguenza). 16.01.1975.

#### DESCRIPTION

Female-capitulum ovate, compressed, composed of 14 calcified plates, covered by transparent, hirsute cuticle. Occludent and carinal margins strongly convex. Tergum, scutum, upper and rostral latus all biramous or V-shaped, intermediate parts of the plates wide.

Scutum with a wide convex triangular occludent part, and a very narrow, curved tergal segment, former widest at base; umbo apical. Tergum V-shaped, occludent branch curved, terminal end transverse; carinal branch nearly twice as long as occludent branch; apex acute,

somewhat recurved; upper part of carinal margin with projection. Carina arched, umbo turning inward, not quite terminal, a flattened continuation of sides extending beyond it; roof smooth, without intermediate channel and bordering ribs. Upper latus V-shaped, with two branches nearly equal, somewhat curved; umbo apical. Rostrum small, narrow, between apices of rostral latera. Rostral latus also V-shaped, basal branch shorter. Carinal latus triangular, twice as high as wide. Inframedian latus quadrangular, rostral border longest; oblique upper margin slightly concave; middle of plate narrower, umbo at lower half of plate.

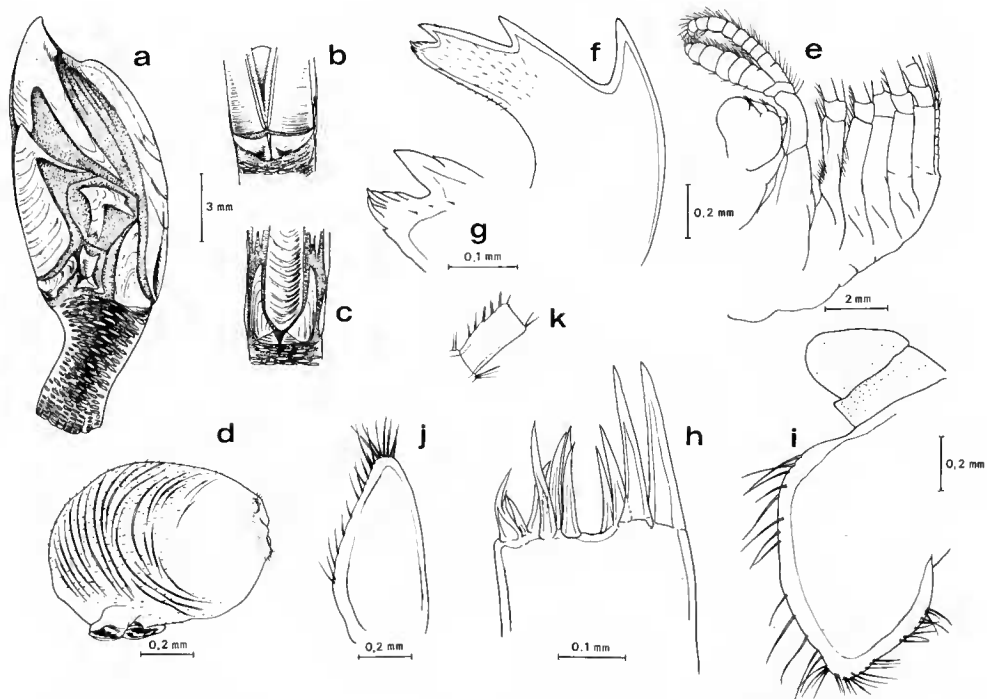


FIG. 3. — *Neoscalpellum crosnieri* sp. n. : a, view of right side of female; b, view of rostrum and surrounding plate; c, carinal view; d, dwarf male; e, soft body; f, g, mandible; h, maxilla I; i, maxilla II; j, palp; k, intermediate segment of cirrus VI.

Peduncle shorter than capitulum, with many small, narrow scales.

Labrum bullate, crest armed with small teeth. Palp small, triangular. Mandible with 3 teeth, inferior angle with 8 small spines. Maxilla I with medial notch, with 2 large and 2 smaller spines above, about 7 spines below. Maxilla II subquadrate, maxillary lobe large.

Cirri long, numbers of segments of two rami as follows :

I	II	III	IV	V	VI
8 11	21 23	27 28	29 30	34 20+	36 33

Anterior ramus of cirrus I shorter and wider than the posterior one; other cirri with subequal rami, each intermedial segment with 4-5 pairs of setae on anterior margin.

Caudal appendage nearly equal to length of protopodite of cirrus VI, consisting of 8 segments with setae.

Penis absent.

Dwarf male on inner side of right scutum, body sac-shaped, covered by chitinous mantle bearing transverse lines and minute teeth; pole bears projections with fine setae, prehensile antennae found near other pole.

#### REMARKS

Of this species, only a single specimen was collected. It is related to *Neoscalpellum debile* (Aurivillius). The species differs from the latter by: the upper latus without a narrow appendage of third branch arising at the apex, the roof of the carina smooth, without intermediate channel and bordering ribs, the presence of many small scales on the peduncle.

#### Genus ANNANDALEUM Newman and Ross, 1971

#### 4. *Annandaleum gruvellii* (Annandale, 1906)

(Fig. 4 a-c)

*Scalpellum gruvellii* Annandale, 1906 : 390; 1913 : 232; CALMAN, 1918 : 124.

*Scalpellum imperfectum* Pilsbry, 1907 : 75, fig. 30, pl. 4, figs. 15, 16; BARNARD, 1924 : 46; MACDONALD, 1929 : 537, pl. 2, fig. 3; STUBBINGS, 1961 : 11, fig. 2.

*Scapellum chitinosum* Hoek, 1907 : 73, pl. 7, fig. 4.

*Annandaleum gruvellii* : NEWMAN and ROSS, 1971 : 122.

*Mesoscalpellum gruvellii* : LAKESHMANA and NEWMAN, 1972 : 84, fig. 8.

*Annandaleum gruvellii gruvellii* : ZEVINA, 1981 : 167, fig. 119.

MATERIAL : Ci 2061, MNHN, Paris. Madagascar, 18°00' S, 43°00' E. Depth 1715-1750 m. 16.01.1975.

#### REMARKS

There is only one specimen in the collection. Length of capitulum : 24.0 mm, width : 12.8 mm; length of peduncle : 10.8 mm, width : 6.6 mm.

The outline and internal structures of the specimen agree well with the descriptions and figures of PILSBRY (1907) and STUBBINGS (1961). Its capitulum bears a small subtriangular rostrum. The inframedian latus is narrower and longer, the umbo situated at lower part of the plate.

The labrum is bullate, not prolonged forwardly. The mandible has 4 teeth, including the inferior angle. The maxillary lobe of maxilla II is large. The first pair of cirri has unequal rami, of 9 and 11 segments. The shorter anterior ramus is about twice as wide as the other one. The caudal appendage consists of 6 segments, terminating in group of spines.

DISTRIBUTION : The species has a world wide distribution : Indian, Atlantic and Pacific Oceans.



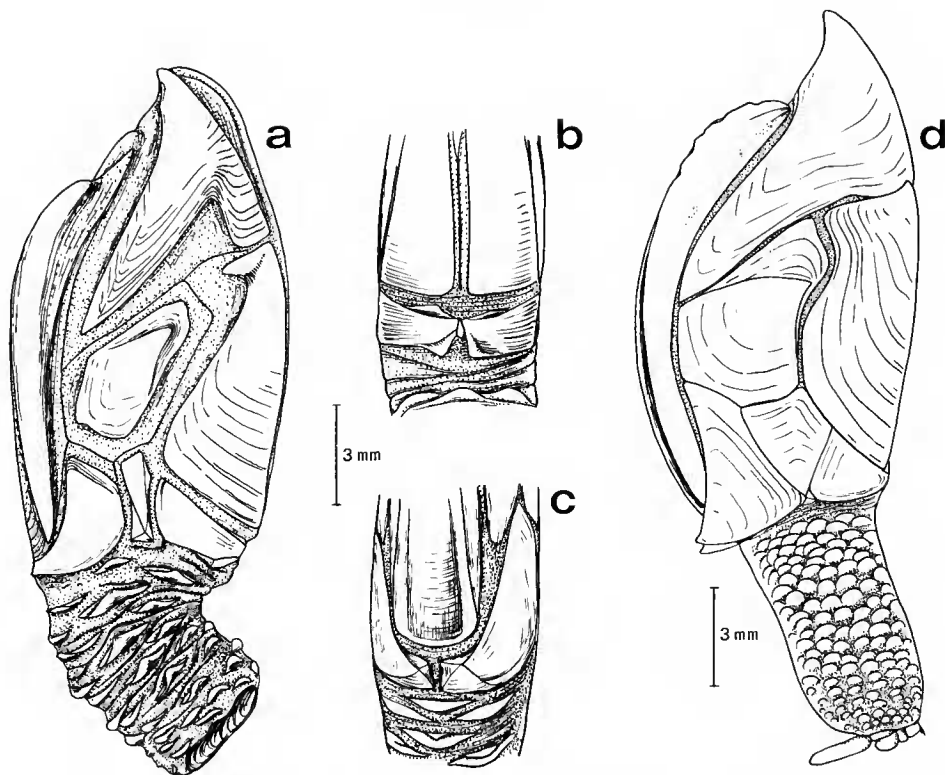


FIG. 4. — a-c, *Annandaleum gruvelii* (Annandale) : a, individual viewed from left side ; b, rostral view ; c, carinal view. — d, *Pilsbryiscalpellum condensum* (Nilsson-Cantell), individual viewed from left side.

Subfamily ARCOSCALPELLINAE Zevina, 1978

Genus PILSBRYISCALPELLUM Zevina, 1978

5. *Pilsbryiscalpellum condensum* (Nilsson-Cantell, 1921)

(Fig. 4 d)

*Scalpellum condensum* Nilsson-Cantell, 1921 : 202, fig. 31; HIRO, 1933 : 35, pl. 1, figs. 12-12b; 1937 : 45, fig. 36.

*Pilsbryiscalpellum condensum* : ZEVINA, 1978b : 1348; 1981 : 215, fig. 153; LIU and REN, 1985 : 201, fig. 11, pl. 2, figs. 8-10.

MATERIAL : Ci 2062, MNHN, Paris. 1 specimen. Madagascar, 12°38.5' S, 48°16.5' E. Depth 240 m. 11.10.1974.

REMARKS

Of this species, the single specimen agrees well with the description and figure of NILSSON-CANTELL (1921), except that the upper latus is greater and the umbo slightly curved.

Length of capitulum : 16.7 mm, width : 8.4 mm; length of peduncle : 6.5 mm, width : 4.0 mm.

DISTRIBUTION : East China Sea, Japan and Madagascar. The species is recorded for the first time from Indian Ocean.

Genus **ANGULOSCALPELLUM** Zevina, 1978

6. **Anguloscalpellum quadrihamulum** sp. n.

(Fig. 5)

HOLOTYPE : Ci 2063, MNHN, Paris. Capitulum : length 37.2 mm, width 22.3 mm; peduncle : length 24.2 mm, width 13.1 mm. Madagascar, 12°27.7' S, 48°15.5' E. Depth 600-605 m. Attached on a piece of shell. 19.01.1972.

PARATYPES : Ci 2064, MNHN, Paris. 5 specimens (2 kept at IOAS), attached on rock and shell. Madagascar, 12°43' S, 48°15' E. Depth 348-360 m. 14.04.1971.

OTHER MATERIALS EXAMINED : Ci 2065, MNHN, Paris. 1 specimen. Together with *Chirona tenuis* (Hoek); Madagascar, 12°43' S, 48°15' E. Depth 348-360 m. 14.04.1971. — Ci 2066, MNHN, Paris. 2 specimens. Madagascar, 12°41.3' S, 48°16' E. Depth 308-314 m. 15.04.1971. — Ci 2067, MNHN, Paris. 1 specimen. Attached on rock. Madagascar, 12°38.5' S, 48°16.5' E. Depth 240 m. 11.10.1974. — Ci 2068, MNHN, Paris. 1 specimen. Madagascar, 12°39.8' S, 48°15.2' E. Depth 375-385 m. 14.04.1971. — Ci 2069, MNHN, Paris. 2 specimens. Attached on small tubes. Madagascar, 13°48.8' S, 47°29.4' E. Depth 1800-2000 m. 27.02.1975. — Ci 2070, MNHN, Paris. 6 specimens. Attached on calcified tubes. Madagascar, 12°42.4' S, 48°14.3' E. Depth 285-295 m. 15.09.1972. — Ci 2071, MNHN, Paris. 4 specimens. Attached on rock. Madagascar, 15°24.5' S, 46°02' E. Depth 250-265 m. 7.11.1972. — Ci 2072, MNHN, Paris. 2 specimens. Attached on rock. Madagascar, 12°43' S, 48°15.5' E. Depth 290-295 m. 18.01.1972.

DESCRIPTION

Female-capitulum triangular, occludent and carinal margins slightly arched, covered by transparent and hirsute cuticle with 14 fully calcified plates. Scutum trapezium, occludent margin arched, tergal and basal margins slightly concave, umbo at upper apex. Tergum large, triangular, margins slightly arched. Carina evenly arched, umbo apical, reaching to centre of upper part of both terga; roof deeply channeled between two wider lateral ribs, which bear longitudinal and transverse growth striae; sides narrow. Rostrum small, triangular, two lateral parts of plate lower, umbo apical. Upper latus triangular, umbo apical. Rostral latus narrower, triangular, lower part slightly concave. Inframedian latus small, triangular, width longer than height, umbo apical, curved inward. Carinal latus irregularly triangular, umbo greatly projecting beyond carinal margin, horn-like, basal part of two plates close to basal part of carina.

Peduncle shorter than capitulum, pillar-shaped, with 10-13 rows of dilated scales, about 7-14 in each row, cuticle covered with setae.

Dorsal surface of prosoma of soft body with 7 swollen projections, 3 pairs on basal parts of cirri III-V and below great one on center of dorsal part, and 2 pairs of hamate spines on dorsal part of 3-4 cirri, trended to terminal end of body.

Labrum bullate, anterior portion projected, crest without small teeth. Palp small, with setae. Mandible with 3 teeth, inferior angle pectinate. Cutting edge of maxilla I without notch, with 3 large spines above and 34 spines ventrally. Maxilla II with nonsetose notch on frontal portion, maxillar lobe very short, with setae.

Number of segments of cirri I-VI of paratypes as follows :

<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>
14    19	25    29	30    30	29    32	34    29	31    33

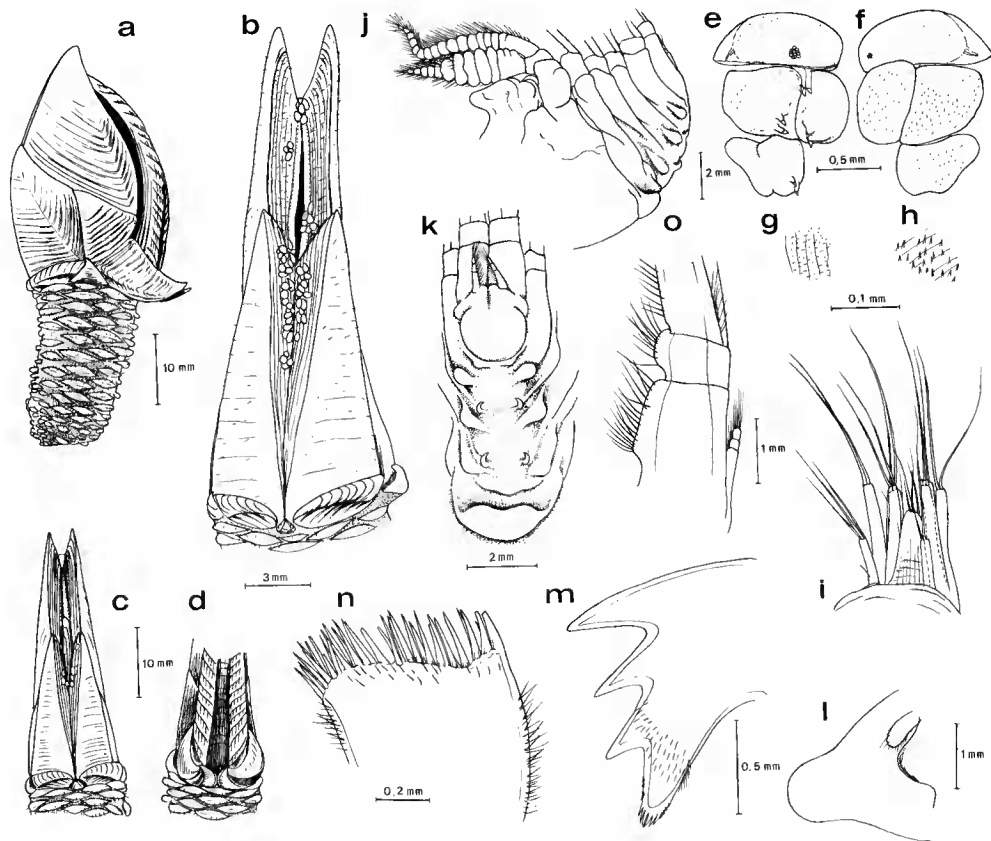


FIG. 5. — *Anguloscalpellum quadrihamulum* sp. n. : a, view of right side of female; b, c, rostral view showing dwarf male; d, carinal view; e, abdominal view of dwarf male and cypris; f, dorsal view of dwarf male and cypris; g, abdominal teeth of dwarf male; h, dorsal teeth of dwarf male; i, cirri and penis of dwarf male; j, soft body; k, view of dorsal side of thorax; l, labrum and palp; m, mandible; n, maxilla I; o, caudal appendage.

Anterior ramus of cirrus I short, 2.5 time as wide as posterior. Anterior and posterior rami in cirri II-VI subequal in length, each of intermediate segments with 5 pairs of setae on anterior margin.

Caudal appendage short, 3 articulated, with setae. Penis absent.

Dwarf male and cypris larve attached on occludent margins. A maximum of 68 was counted. Dwarf male oval, sac-shaped, greatest diameter 0.64 mm, outer surface with small teeth, dorsal teeth larger, abdominal teeth very small; prehensile antennae found on abdomen; body degenerate, nonexistent, 4 pairs of cirri and penis, with setae. Long diameter of cypris larve : 1.06 mm.

#### REMARKS

This new species differs from all other species of the genus *Anguloscalpellum* in having 4 dorsal curved hamate spines and 7 swollen projections on the soft parts. It is similar to *Anguloscalpellum wyethi* (Cornwall) in the shape of the capitulum and mandible, but the later is without dorsal spines and projections, and can easily be distinguished from the present species.

### Genus **TRIANGULOSCALPELLUM** Zevina, 1978

#### 7. *Trianguloscalpellum michelottianum* (Seguenza, 1876)

(Fig. 6)

- Scalpellum michelottianum* Seguenza, 1876 : 381, pl. 6, figs. 15-25; PILSBRY, 1907 : 32.  
*Scalpellum velutinum* Hoek, 1883 : 96, pl. 4, figs. 10, 11, pl. 9, figs. 7-9; WELTNER, 1897 : 251; 1922 : 75; GRUVEL, 1902 : 56, pl. 2, figs. 3c, 10a-b, 14, pl. 3, figs. 1, 27-31, pl. 4, figs. 6, 11-22; 1905 : 73, fig. 83; 1920 : 27, pl. 1, figs. 8-10, pl. 7, fig. 4; ANNANDALE, 1905 : 83; 1911b : 588; 1916 : 129, pl. 6, figs. 6-7; PILSBRY, 1907 : 26; CALMAN, 1918 : 108; NILSSON-CANTELL, 1927 : 743, fig. 1; 1928 : 4; 1938 : 8; BROCH, 1931 : 18; STUBBINGS, 1936 : 28, fig. 12; 1967 : 234.  
*Scalpellum eximium* Hoek, 1883 : 100, pl. 4, figs. 6, 7, pl. 9, fig. 10; WELTNER, 1897 : 247.  
*Scalpellum sordidum* Aurivillius, 1898 : 190.  
*Scalpellum erectum* Aurivillius, 1898 : 192; GRUVEL, 1905 : 74.  
*Scalpellum alatum* Gruvel, 1900 : 192; 1902 : 57.  
*Arcoscalpellum michelottianum* : WITHERS, 1953 : 225; NEWMAN and ROSS, 1971 : 71, fig. 34, pl. 9b; LAKSHMANA RAO and NEWMAN, 1972 : 76, fig. 5; ZEVINA, 1978b : 1350; 1981 : 343, fig. 263.  
*Arcoscalpellum velutinum* : WEISBORD, 1977 : 273, figs. 1, 2.  
*Trianguloscalpellum michelottianum* : LIU and REN, 1985 : 207, fig. 14, pl. 4, figs. 10-12.

**MATERIAL** : Ci 2073, MNHN, Paris. 2 specimens. Attached on rock. Madagascar, 18°05' S, 42°53' E. Depth 1930 m. 16.01.1975. — Ci 2074, MNHN, Paris. 2 specimens. Attached on rock. Madagascar 13°43.8' S, 47°29.0' E. Depth 1950-2150 m. 20.01.1975. — Ci 2075, MNHN, Paris. 1 specimen. Madagascar, 17°40.0' S, 43°12.0' E. Depth 1075-1115 m. 15.01.1975. — Ci 2076, MNHN, Paris. 2 specimens. Attached on rock. Madagascar, 13°02' S, 48°02' E. Depth 1000-1525 m. 21.01.1975. — Ci 2077, MNHN, Paris. 6 specimens (2 kept at IOAS). Madagascar, 13°01' S, 48°01' E. Depth 1075-1110 m. 21.01.1975. — Ci 2078, MNHN, Paris. 1 specimen. Madagascar, 17°50' S, 43°07' E. Depth 1475-1530 m. 16.01.1975.

#### REMARKS

Specimens from Madagascar correspond to LIU and REN's description of specimens collected from the East China Sea. However the umbo of their inframedian latus is thicker and slightly projected outwards. The caudal appendage consists of 4-5 segments.

Measurements of largest specimen : length of capitulum : 53.7 mm, width : 34.6 mm ;  
length of peduncle : 31.0 mm, width : 27.5 mm.

DISTRIBUTION : Antarctic, Pacific, Mediterranean and Indian Oceans.

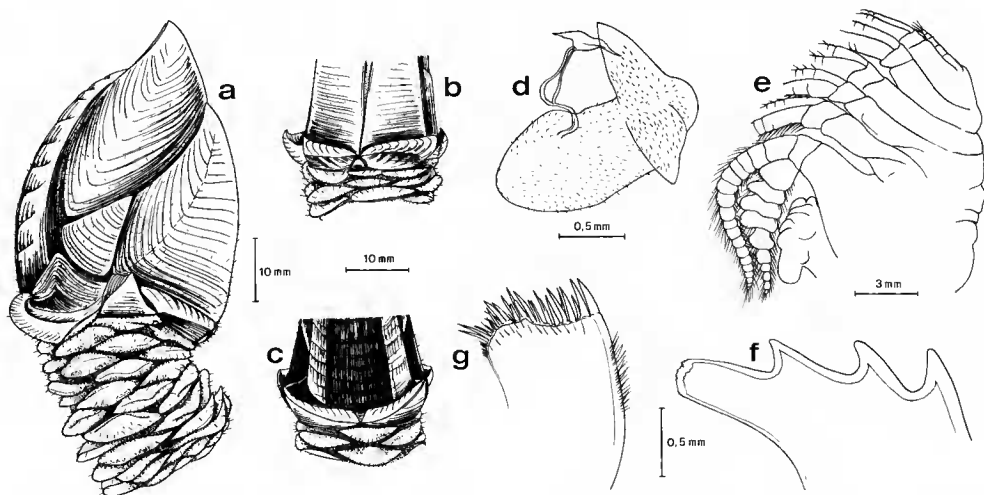


FIG. 6. — *Trianguloscalpellum michelottianum* (Seguenza) : a, view of left of female ; b, rostral view ; c, carinal view ; d, dwarf male ; e, soft body ; f, mandible ; g, maxilla I.

Family LEPADIDAE Darwin, 1851

Genus LEPAS Linnaeus, 1758

### 8. *Lepas anatifera anatifera* Linnaeus, 1758

*Lepas anatifera* Linnaeus, 1758 : 668 ; DARWIN, 1851 : 73, pl. 1, fig. 1 ; HOEK, 1883 : 38, pl. 1, figs. 1, 2 ; PILSBRY, 1896 : 208 ; 1907 : 79, figs. 3-5 ; WELTNER, 1897 : 439 ; GRUVEL, 1905 : 108 ; ANNANDALE, 1909 : 73 ; STEBBING, 1910 : 563 ; KRÜGER, 1911 : 23, figs. 36-41 ; JENNINGS, 1918 : 57 ; NILSSON-CANTELL, 1921 : 236 ; BROCH, 1924 : 46, fig. 15 ; HIRO 1937*b* : 396, figs. 2, 3a ; 1937*c* : 56, fig. 46 ; 1939 : 204 ; HENRY, 1940 : 37, pl. 4, fig. 7 ; UTINOMI, 1949 : 20 ; 1958 : 287 ; 1970 : 341 ; TARASOV and ZEVINA, 1957 : 104, figs. 14, 24, 26, 28 ; STUBBINGS, 1967 : 237 ; ZEVINA, 1968 : 35 ; GORDON, 1970 : 28, fig. 9.

*Lepas anatifera anatifera* : NEWMAN, 1972 : 36 ; ARNAUD, 1973 : 157 ; LIU and REN, 1985 : 218, fig. 19, pl. 5, fig. 10.

MATERIAL : Ci 16, MNHN, Paris. 31 small specimens attached to stalk. Madagascar, N. W. coast off Nosy Be. 1958.

DISTRIBUTION

Pacific, Atlantic and Indian Oceans : tropical, subtropical and temperate seas.

9. **Lepas indica** Annandale, 1909

*Lepas anatifera indica* Annandale, 1909 : 76, figs. 3, 4; DANIEL, 1956 : 6, figs. 12-15; NEWMAN, 1972 : 36.

*Lepas indica* : LIU and REN, 1985 : 220, fig. 20, pl. 5, figs. 15-17.

MATERIAL : Ci 14, MNHN, Paris. One specimen from Mozambique Channel, together with *Conchoderma virgata* (Spengler), *C. auritum* (Linnaeus) and *C. hunteri* (Owen).

REMARKS

Only one small specimen was collected. Measurements : length of capitulum : 13.0 mm, width : 8.4 mm; length of peduncle : 6.6 mm, width : 3.0 mm.

The species resembles *Lepas anatifera anatifera* in general features. It differs from the latter in having two dorsal and one vertical longitudinal ridges on the peduncle.

DISTRIBUTION : South China Sea and Indian Ocean (Bay of Bengal). The species is recorded for the first time from Madagascar waters.

Genus **CONCHODERMA** Olfers, 1814

10. **Conchoderma auritum** (Linnaeus, 1767)

(Fig. 7 a-d)

*Lepas aurita* Linnaeus, 1767 : 1110.

*Conchoderma auritum* : OLFERS, 1841 : 117; PILSBRY, 1907 : 99, pl. 9, fig. 2; 1911 : 71, pl. 8, figs. 5-7;

BROCH, 1924 : 55, fig. 19; TARASOV and ZEVINA, 1957 : 115, figs. 30-31; REN, 1987 : 176, fig. 3.

*Conchoderma aurita* : DARWIN, 1851 : 141, pl. 3, fig. 4.

MATERIAL : Ci 2100 MNHN, Paris. 5 specimens from Mozambique Channel. Together with *Conchoderma virgata* (Spengler) and *C. hunteri* (Owen).

REMARKS

The specimens are small and flesh-coloured in alcohol. All of them have distinct shell plates. The scutum is large and triangular; the carina small and oval. The umbo of the tergum is on the posterior of the plate.

Measurements of largest specimen : length of capitulum : 15.2 mm, width : 10.2 mm; length of peduncle : 15.3 mm, width : 4.6 mm.

DISTRIBUTION : This species occurs in all oceans round the world.

11. *Conchoderma virgata* (Spengler, 1790)

(Fig. 7 e)

*Lepas virgata* Spengler, 1790, Skrifter Naturhist. Selbskabet, B. i, Tab. vi, fig. 9 (not seen).

*Conchoderma virgata* : DARWIN, 1851 : 146, pl. 3, fig. 4; ZEVINA, 1980 : 692; LIU and REN, 1985 : 225, fig. 23.

*Conchoderma virgatum* : HOEK, 1883 : 55; GRUVEL, 1905 : 144, fig. 168; 1920 : 38; PILSBRY, 1907 : 99, pl. 9, fig. 1; ANNANDALE, 1909 : 80; STEBBING, 1910 : 566; JENNINGS, 1918 : 59; NILSSON-CANTELL, 1921 : 242; 1928 : 16, fig. 7; 1930 : 251, pl. 1, fig. 4; BROCH, 1924 : 58, fig. 20; BARNARD, 1924 : 61; KRÜGER, 1927 : 13; HIRO, 1936*b* : 623, fig. 2; 1937*b* : 402, fig. 5; 1937*c* : 62, fig. 53; 1939*a* : 205; 1939*b* : 248; STUBBINGS, 1936 : 4; 1967 : 240; UTINOMI, 1970 : 341; NEWMAN and ROSS, 1971 : 35, fig. 11, pl. 5, E; HASTINGS, 1972 : 274; WILLIAMS, 1978 : 109, pl. 1; DONG *et al.*, 1980 : 125.

MATERIAL : Ci 2099, MNHN, Paris. 3 small specimens from Mozambique Channel, together with *Conchoderma auritum* (Linnaeus) and *C. hunteri* (Owen).

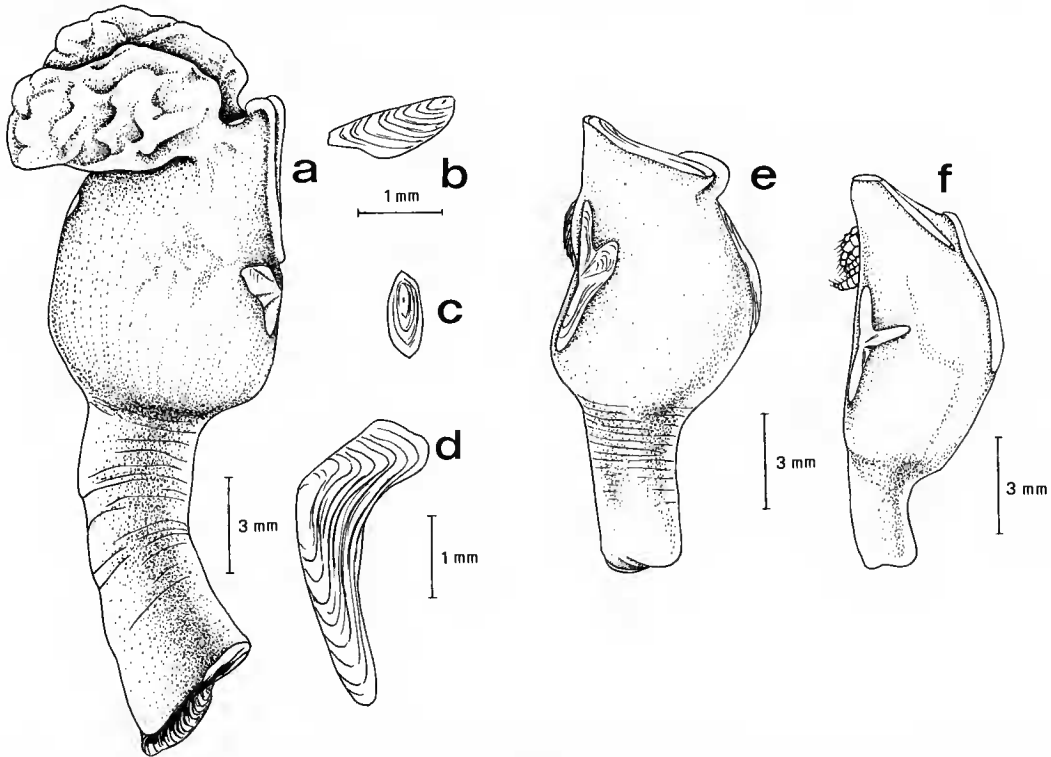


FIG. 7. — a-d, *Conchoderma auritum* (Linnaeus) : a, lateral view ; b, tergum ; c, carina ; d, scutum. — e, *Conchoderma virgata* (Spengler), lateral view. — f, *Conchoderma hunteri* (Owen), lateral view.

REMARKS

The specimens are small and flesh-coloured in alcohol, without longitudinal striae. The tergal and carinal margins of the capitulum form an angle, the lateral lobe of scutum is wider. Their general features correspond to DARWIN's descriptions.

DISTRIBUTION : Pacific, Atlantic, Antarctic and Indian Oceans.

12. *Conchoderma hunteri* (Owen, 1830)

(Fig. 7 f)

*Cineras Hunteri* Owen, 1830, Cat. Mus. Coll. Of Surgeons. Invert., part. 1 : 71 (not seen).  
*Conchoderma Hunteri* : DARWIN, 1851 : 153, pl. 3, fig. 3; WELTNER, 1897 : 240; GRUVEL, 1905 : 145, fig. 169; BARNARD, 1955 : 247; LIU and REN, 1985 : 227, fig. 25, pl. 6, figs. 12-16.  
*Conchoderma virgatum* var. *Hunteri* Annandale, 1909 : 82; KRÜGER, 1911 : 26, pl. 3, figs. 20-22.  
*Conchoderma virgatum* var. *japonica* Krüger, 1911 : 27, pl. 3, fig. 23.  
*Conchoderma virgatum* forma *Hunteri* : BROCH, 1931 : 28; NILSSON-CANTELL : 1938 : 27.  
*Conchoderma virgatum hunteri* : HIRO, 1937b : 402, fig. 6; 1937c : 63, fig. 53; 1939a : 205; UTINOMI, 1968 : 167; 1970 : 341; GORDON, 1970 : 21, fig. 6; DONG *et al.*, 1980 : 125.

MATERIAL : Ci 2101, MNHN, Paris. 1 specimen from Mozambique Channel, together with *Conchoderma virgata* (Spengler) and *C. auritum* (Linnaeus).

REMARKS

Only one small specimen was identified. The body is flesh-coloured, without longitudinal striae. The plates are slender and long.

Measurements : length of capitulum : 14.0 mm, width : 7.8 mm; length of peduncle : 5.0 mm, width : 2.5 mm.

DISTRIBUTION : Pacific and Indian Ocean.

Family POECILASMATIDAE Annandale, 1909

Genus TEMNASPIS Fischer, 1884

13. *Temnaspis amygdalum* (Aurivillius, 1894)

(Fig. 8 a-b)

*Poecilasma amygdalum* Aurivillius, 1894 : 10, pl. 1, figs. 4-6, pl. 8, fig. 14; GRUVEL, 1905 : 118, fig. 135; NILSSON-CANTELL, 1921 : 262, fig. 48a-c.  
*Poecilasma fissum* Hoek, 1907 : 8, pl. 10, figs. 2-5 (part); ANNANDALE, 1909 : 92 (part).  
*Poecilasma amygdalum madagascariense* Nilsson-Cantell, 1921 : 264, figs. 46d-g, pl. 3, fig. 6.  
*Trilasmis fissum hawaiiense* Pilsbry, 1928 : 306, pl. 24, figs. 1-8.  
*Trilasmis (Temnaspis) amygdalum* : HIRO, 1937c : 85, fig. 69; 1937b : 412, figs. 10-11; NILSSON-CANTELL, 1938 : 28; UTINOMI, 1949 : 21; 1962 : 61; FOSTER, 1974 : 38, fig. 1g.  
*Temnaspis amygdalum* : UTINOMI and KIKUCHI, 1966 : 5; DONG *et al.*, 1980 : 125; LIU and REN, 1985 : 243, fig. 36, pl. 10-14.

MATERIAL : Ci 1811, MNHN, Paris. 25 specimens, on mouth parts of lobster, from Mitsio Islands, N. W. of Madagascar. Depth 3-4 m. 8.07.1973. — Ci 2079, MNHN, Paris. 2 small specimens. Madagascar, 12°44.2' S, 48°14.2' E. Depth 395-405 m. 14.04.1971.

REMARKS

These specimens correspond with NILSSON-CANTELL's description (1921) of materials from Madagascar. The capitulum has 5 smooth plates; the scutum has 2 lobes; the carina does not



extend to the area between both terga. The peduncle has circles of small protuberances. The cirri are short.

DISTRIBUTION : Tropical west and central-Pacific including South China Sea, Japan, Philippines, Fiji and Hawaii, and Indian Ocean.

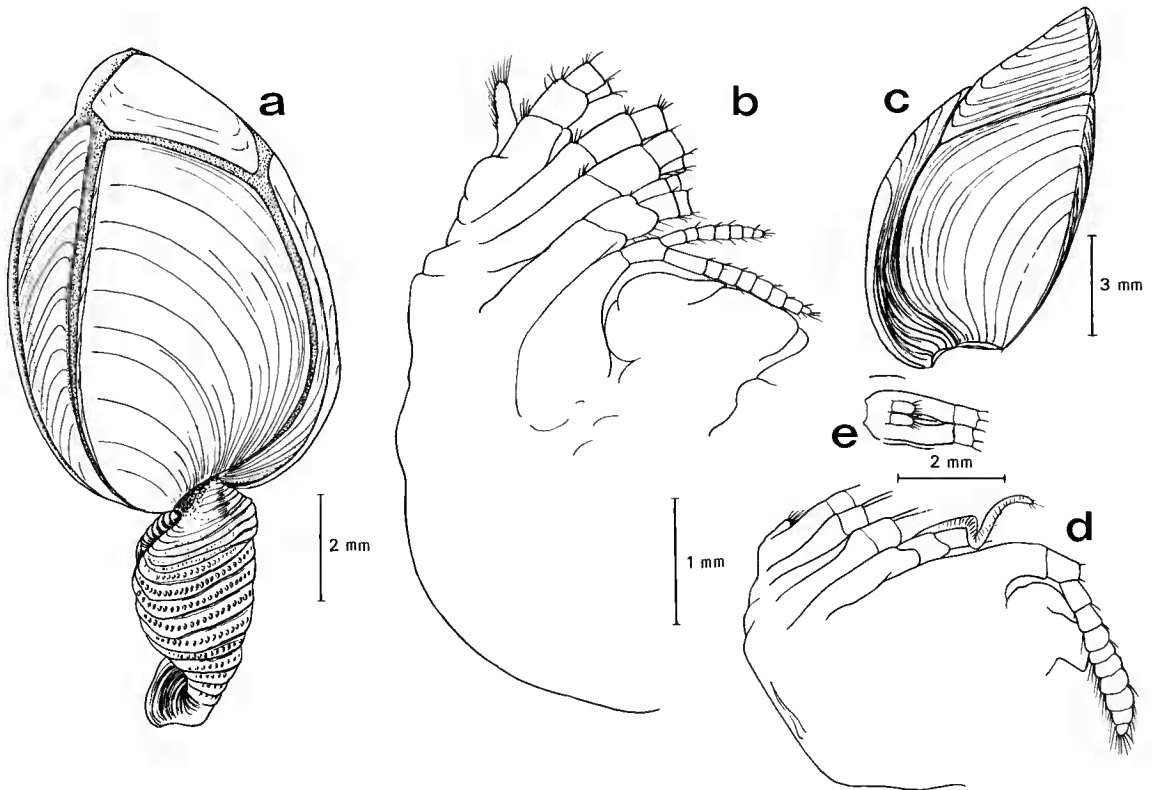


FIG. 8. — a-b, *Temnaspis amygdalum* (Aurivillius) : a, individual viewed from right side; b, soft body. — c-e, *Megalasma (Glyptelasma) annandalei* Pilsbry : c, individual viewed from left side; d, soft body; e, caudal appendage.

### Genus MEGALASMA Hoek, 1883

#### 14. *Megalasma (Glyptelasma) annandalei* Pilsbry, 1907

(Fig. 8 c-e)

*Megalasma annandalei* Pilsbry, 1907 : 89, pl. 5, fig. 14, pl. 7, figs. 15-19; CALMAN, 1919 : 363.  
*Megalasma (Glyptelasma) pilsbryi* Calman, 1919 : 365, figs. 1-2; NILSSON-CANTELL, 1928 : 20, fig. 9;  
1938 : 10; LAKSHMANA RAO and NEWMAN, 1972 : 87, fig. 9; LIU and REN, 1985 : 260, fig. 48, pl. 12,  
figs. 4-9.

MATERIAL : Ci 2080, MNHN, Paris. 4 specimens, together with *Trianguloscapellum michelottianum*.  
Madagascar, 13°01' S, 48°01' E. Depth 1075-1110 m. 21.01.1975.

#### REMARKS

The specimens agree with PILSBRY'S descriptions. The capitulum is twice as long as wide; the peduncle is cylindrical, with an obscure carinal keel. The dorsal surface of the prosoma, near its posterior margin, has a pair of short and slender filamentary appendages. The caudal appendages is short and 1 segmented, the end with a few apical setae. The penis is slender, with setae, the mandible has 4 teeth and a lower angle.

The specimens are very similar to LIU and REN'S specimens from the East China Sea in the outline and soft body, but the outer cuticle of the capitulum is not indestructible.

Measurement of largest specimen : length of capitulum 18.3 mm, width : 9.3 mm.

DISTRIBUTION : East China Sea, Malay Archipelago, Mid-Pacific, Indian Ocean, East Africa.

#### Family IBLIDAE Annandale, 1909

#### Genus **IBLA** Leach, 1825

#### 15. **Ibla cumingi** Darwin, 1851

(Fig. 9 a-c)

*Ibla cumingii* Darwin, 1851 : 183, pl. 4, fig. 8.

*Ibla cumingi* : WELTNER, 1897 : 251; HOEK, 1907 : 47; ANNANDALE, 1911a : 229; 1916 : 131, pl. 7, figs. 8-9; NILSSON-CANTELL, 1921 : 222, fig. 36; HIRO, 1936a : 215; 1937b : 393, fig. 1; 1937c : 49, fig. 41; UTINOMI, 1970 : 340; ROSELL, 1972 : 152, pl. 1, fig. 1; 1980 : 124; LIU and REN, 1985 : 215, fig. 18, pl. 5 : 1-4.

*Ibla sibogae* Hoek, 1907 : 48, pl. 4, figs. 20-22, pl. 5, figs. 1-8.

*Ibla cumingi sibogae* : NEWMAN, 1960 : 100, figs. 1-2.

MATERIAL : Ci 19, MNHN, Paris. 22 specimens collected from Madagascar, N. W. coast off Nosy Be. Intertidal zone. 1956.

#### REMARKS

Of this species, the 4 valves of the female are blue coloured along the lateral margins. The structure of the body, the mouth part and cirri correspond with DARWIN'S description, except in its longer caudal appendages, which reaches to the third segment of cirrus VI. Two dwarf males were founded on one dissected specimen, attached to the wall of the body sack, by a cement disc. They are small, and worm-like, with mouth-part, rudimentary cirri and an eye spot.

Measurements of largest specimen : length of body 11.3 mm, width 3.8 mm.

DISTRIBUTION : South China Sea, Japan, Malay Archipelago, Andaman Sea, Red Sea. This species is newly recorded from Madagascar waters.

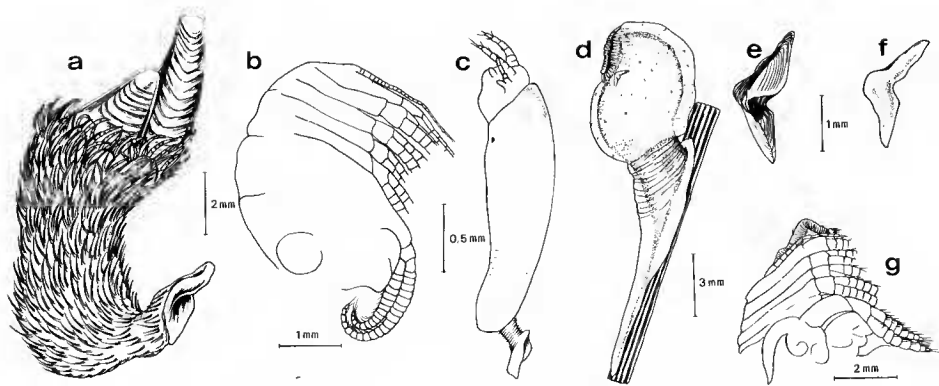


FIG. 9. — a-c, *Ibla cumingi* Darwin : a, individual viewed from right side; b, soft body; c, dwarf male. — d-g, *Paralepas nodulosa* (Broch) : d, individual viewed from left side; e, outer side of scutum; f, inner side of scutum; g, soft body.

Family HETERALEPADIDAE Nilsson-Cantell, 1921

Genus PARALEPAS Pilsbry, 1907

16. *Paralepas nodulosa* (Broch, 1922)  
(Fig. 9 d-g)

*Heteralepas* (*Paralepas*) *nodulosa* Broch, 1922 : 286, fig. 37.

*Paralepas nodulosa* : NEWMAN, 1960 : 109; LIU and REN, 1985 : 266, fig. 51, pl. 7, figs. 1-4.

MATERIAL : Ci 2081, MNHN, Paris. 2 specimens attached to the spine of an echinoid. Madagascar, 15°20.5' S, 46°09' E. Depth 310-350 m. 7.11.1972. — Ci 2082, MNHN, Paris. 1 specimen attached to the spine of an echinoid. Madagascar, 15°25.7' S, 46°01' E. Depth 200-210 m. 7.11.1972.

REMARKS

Both specimens were attached to the spines of echinoids. They correspond with BROCH's description in general feature. In the specimen from 15°20.5' S, 46°09' E, the capitulum is almost smooth, without obvious warts or small spines, but with transversal wrinkles.

The capitulum is globular; the scutum small, chitinous and triangular below the orifice, which is 1/3 as long as the capitulum. The peduncle is short.

The mandible has 4 teeth and a lower angle. The maxilla I has a distinct notch below strong and small upper spines; below the notch the frontal edge is armed with spines.

A digitiform filamentary appendage is situated at the base of cirrus I. The inner ramus of cirrus I is shorter than the outer ramus. The remaining cirri are comparatively shorter and the dorsal spines of each segment are strong. The caudal appendages have 11 segments and reach to the third segment of cirrus IV, with fine setae.

The penis is short, with annular streaks and fine setae.

Measurements of largest specimen : length of capitulum : 9.8 mm, width : 8.8 mm, length of peduncle : 3.8 mm, width : 4.1 mm.

DISTRIBUTION : East and South China Sea, Malay Archipelago, Indian Ocean.

Suborder VERRUCOMORPHA Pilsbry, 1916

Family VERRUCIDAE Darwin, 1854

Genus VERRUCA Schumacher, 1817

17. *Verruca (Metaverruca) sculpta* Aurivillius, 1898

(Fig. 10)

*Verruca sculpta* Aurivillius, 1898 : 197; GRUVEL, 1920 : 41, pl. 5, figs.26, 27; NILSSON-CANTELL, 1929 : 461, fig. 1; 1938 : 12; BROCH, 1931 : 41; REN, 1984 : 166, fig. 1, pl. 1, figs. 1-6.

*Verruca capsula* Hoek, 1913 : 130, pl. 12, figs. 1-3, pl. 13, figs. 1-4; STUBBINGS, 1936 : 38.

MATERIAL : Ci 2083, MNHN, Paris. 2 specimens attached to shell. Madagascar, 12°49' S, 48°02.7' S. Depth 925-975 m. 10.10.1974.

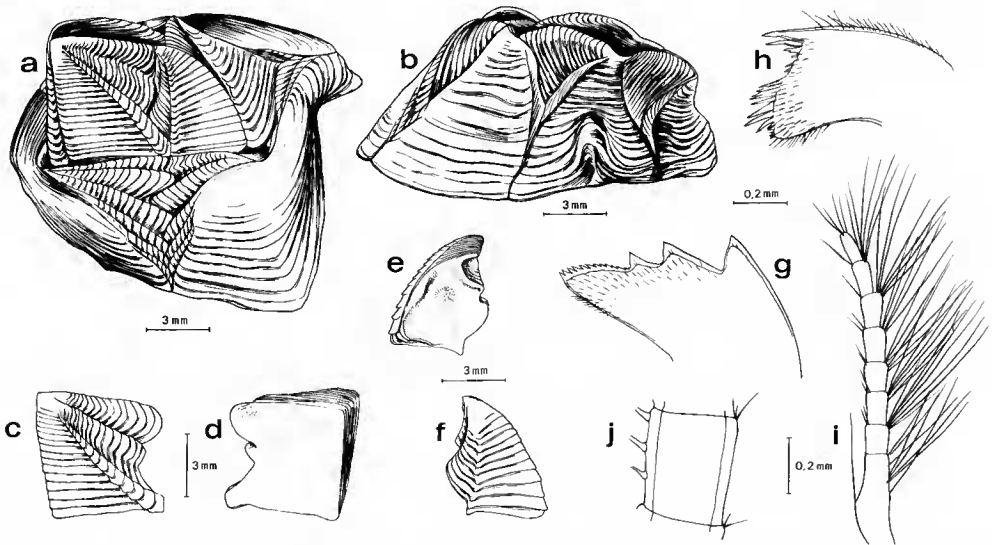


FIG. 10. — *Verruca (Metaverruca) sculpta* Aurivillius : a, shell, upper view; b, fixed scutum and tergum; c, d, movable tergum; e, f, movable scutum; g, mandible; h, maxilla I; i, caudal appendage; j, intermediate segment of cirrus VI.

REMARKS

The shell is whitish, flattened above, almost parallel to the basis, and subcircular. The surface is with concentric growth ridges. The movable scutum is flat, triangular, with three

articular ridges, the articular groove is large and deep; the inner surface is flat. The movable tergum is large, quadrate and flat, with three strong articular ridges. The fixed scutum is roughly quadrate, with ala broadly triangular, radii narrow, and with adductor ridge or myophore. The fixed tergum is triangular, with two broad radii. The carina has 5-6 teeth on its rostral margin, the rostrum has 5 teeth on its carinal margin; upper margins of both valves form a straight line.

The labrum is bullate, its crest with many small teeth. The mandible has 3 teeth, with the inferior angle pectinate. The upper half of the maxilla I has several small spines below two large spines; on the lower half there are long and short spines. The cirrus I has equal rami, the anterior ramus of cirrus II is slightly more than half as long as the posterior. Each of the intermediary segments of cirri III-VI bears 3 pairs of setae on anterior margin. The caudal appendage are half as long as the protopod of cirrus VI or longer, with 5-8 segments densely setose.

Measurements of largest specimen : rostrocarinal length at base : 16.6 mm, at orifice : 11.6 mm; height of fixed tergum : 8.5 mm.

The specimens correspond to the description of the type. They differ from the specimens from East China Sea (REN, 1984) in that there are only 3 pairs of setae on anterior margin of each intermediary segment of cirri III-VI and the pectination of inferior angle of mandible is uniform.

DISTRIBUTION : East China Sea, Indonesia, Fiji, New Zealand, Hawaii, Indian Ocean and South Africa.

### 18. *Verruca (Rostratoverruca) sewelli* Stubbings, 1936

(Fig. 11)

*Verruca (Rostratoverruca) sewelli* Stubbings, 1936 : 35, figs.15,16.

MATERIAL : Ci 2084, MNHN, Paris. 2 living and 9 dry specimens (2 kept at IOAS) attached to Gasteropod shell and chelipeds of crab. Madagascar, 12°44.1'S, 48°10.1'E. Depth 563-570 m. 5.03.1971. — Ci 2085, MNHN, Paris. A small specimen attached to *Chirona tenuis*. Madagascar, 12°44.2'S, 48°14.2'E. Depth 395-405 m. 14.04.1971. — Ci 2086, MNHN, Paris. A small specimen. Madagascar, 18°54'S, 43°55'E. Depth 280-310 m. 24.11.1973.

#### REMARKS

The specimens agree with the description and figures of STUBBINGS (1936). The shell is white, the wall nearly vertical, the fixed scutum and tergum are slightly oblique; the movable scutum and tergum have 3 articular ridges; the movable scutum is triangular, with a very deep adductor pit; the movable tergum is quadrilateral; the rostrum is patelliform, with ridges extending to all margins except the basal; the umbo is produced; in older specimens, the base of the wall is often thickened; the fixed scutum bears a myophore pit and ridge.

The mandible has 3 teeth and its inferior angle is pectinate. The maxilla I has a distinct notch. The anterior ramus of cirrus I-II is short. The caudal appendages have 10 segments, with long setae.

The numbers of plate-ridges of the specimens are variable. The movable scutum has 3-5 plate-ridges. The rostrum may have 19 ridges. The bases of the walls are often thickened in older specimens, but the infraction is indistinct.

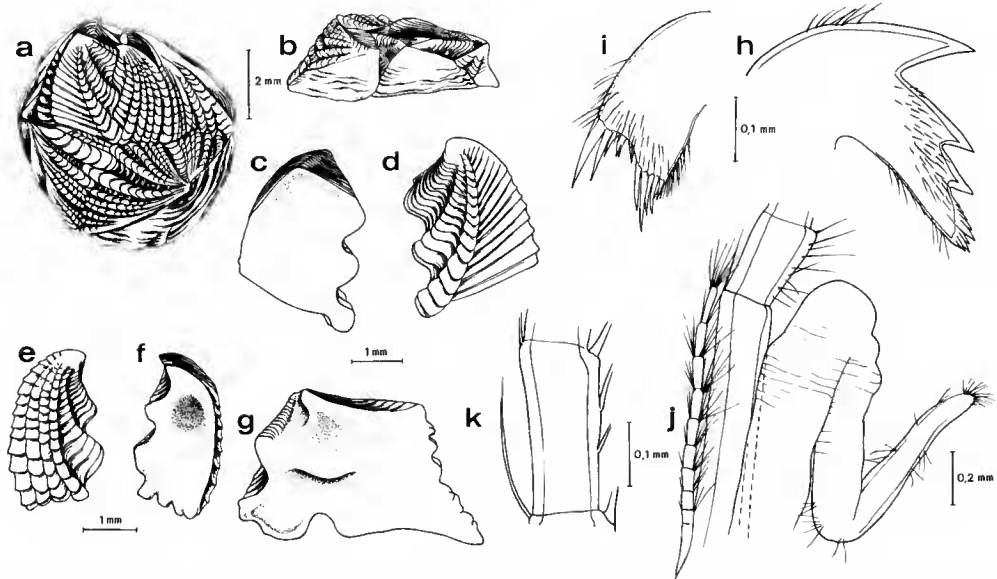


FIG. 11. — *Verruca (Rostratoverruca) sewelli* Stubbings : a, shell, upper view; b, fixed scutum and tergum; c, d, movable tergum; e, f, movable scutum; g, inner side of fixed scutum; h, mandible; i, maxilla I; j, caudal appendage, penis and basal part of cirrus VI; k, intermediate segment of cirrus VI.

Measurements of largest specimen : rostrocarinal length at base : 7.1 mm, at orifice : 5.5 mm; height of fixed tergum : 2.5 mm.

DISTRIBUTION : Zanzibar Area; Madagascar.

Suborder BALANOMORPHA Pilsbry, 1916

Superfamily CORONULOIDEA Leach, 1825

Family TETRACLITIDAE Gruvel, 1903

Genus TETRACLITA Schumacher, 1817

19. *Tetraclita africana* sp. n.

(Fig. 12)

HOLOTYPE : Ci 21-1, MNHN, Paris. Carinorostral diameter 27.4 mm, height of shell 16.8 mm. Madagascar, S. E., Coast of Ste Luce. Intertidal zone. May 1960.

PARATYPES : Ci 21-2, MNHN, Paris. 30 specimens (2 kept at IOAS). Same as the holotype.

DESCRIPTION

Shell conical. Orifice large. Surface eroded, showing fine short ridges or raised lozenges, pink or pink-purple in colour; sutures obliterated. Wall thicker, with a few rows of small pores. Sheath broader, reddish-brown in colour, below greyish-white, smooth or with low ribs at basal portion.

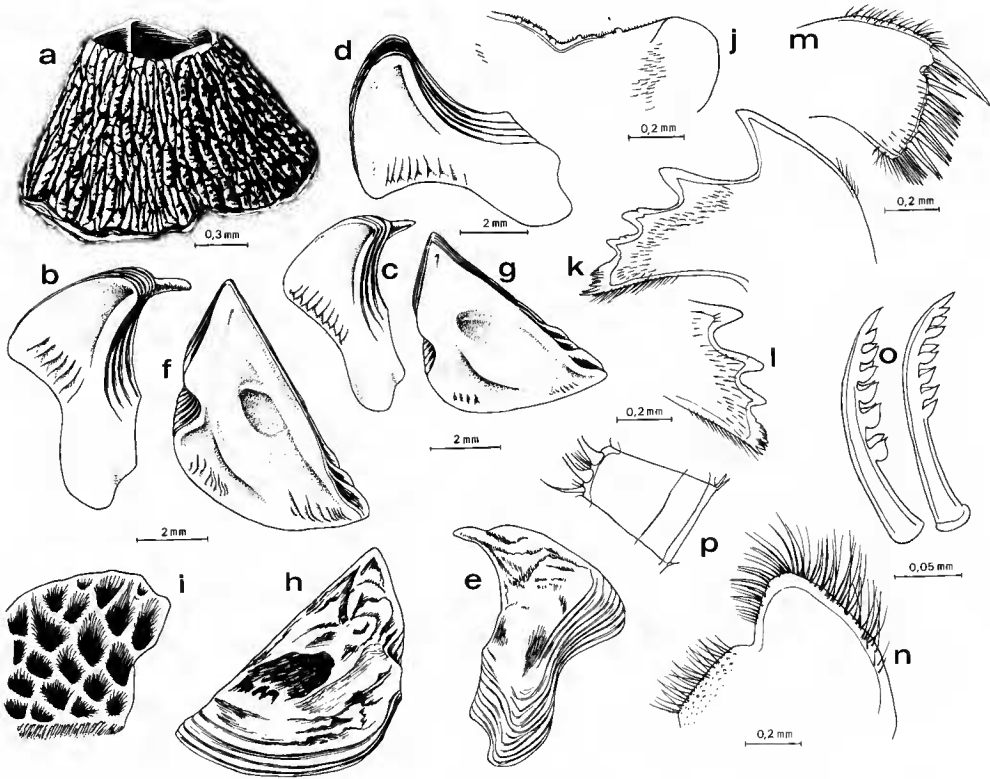


FIG. 12. — *Tetracilita africana* sp. n. : a, shell; b, c, d, e, tergum; f, g, h, scutum; i, basal part of wall; j, labrum; k, l, mandible; m, maxilla I; n, maxilla II; o, denticulata setae of cirrus III; p, intermediate segment of cirrus VI.

Outer surface of scutum eroded, with pink-purple spots; articular ridge well developed and projected; articular groove broad; adductor ridge short, not extended to base and apex, without narrow furrow between it and articular ridge; adductor pit small and deep; crests for depressor muscles well developed; ocludent broader, with three or four strong, oblique teeth. Tergum rather broad, short, often with beaked apex; length of plate 0.5 as width; spur short, broad, end rounded, with distinct basoscutal angle, median furrow broad and shallow; inside whitish with purple spots; articular groove broad, shallow; crests for lateral depressor muscle 7-9 in number.

Labrum with 2-4 teeth on each side of median notch. Mandible with 4 teeth, inferior angle with pectination. Cutting edge of maxilla I straight, with distinct notch; 12 medial spines

between upper and lower pairs of larger spines. Maxilla II with distinct nonsetose notch on frontal portion. Palp conical, long. Numbers of segments of cirri I-VI as follows :

<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>						
⌢		⌢		⌢		⌢		⌢		⌢	
23	15	14	17	17	23	19	21	22	23	24	25

Posterior ramus of cirrus I short, 2/3 as long as anterior. Intermediary segments of cirrus III with denticulate setae, each of medial segments of cirri IV-VI with 3 pairs of setae on anterior margin. Penis long, with scattered soft setae.

#### REMARKS

This new species is very similar to *Tetraclita japonica* Pilsbry in the shell and soft parts, but may easily be distinguished from it by the short adductor ridge of the scutum not being extended to the base and to the apex, without narrow furrow between it and the articular ridge; the adductor pit is small and deep; the spur of the tergum is short and broad, with a rounded end.

### Superfamily BALANOIDEA Leach, 1817

#### Family ARCHAEOBALANIDAE Newman and Ross, 1976

#### Genus **CHIRONA** Gray, 1835

#### 20. *Chirona amaryllis* (Darwin, 1854)

*Balanus amaryllis* Darwin, 1854 : 279, pl. 7, fig. 6a-c; HOEK, 1883 : 153, pl. 7, figs. 4-5; 1913 : 179, pl. 15, figs. 17-21, pl. 16, figs. 1-4; GRUVEL, 1905 : 250, with var. *rosa* and *niveus*; PILSBRY, 1916 : 217; NILSSON-CANTELL, 1921 : 329, pl. 3, fig. 9; HIRO, 1936 : 624; UTINOMI, 1962 : 216; 1966 : 6; 1968 : 174; 1969 : 88, fig. 6; ZEVINA and TARASOV, 1963 : 94; REN and LIU, 1978 : 159, fig. 21, pl. 7, figs. 1-5.

*Balanus amaryllis dissimilis* Lanchester, 1902 : 369, pl. 34, figs. 3-3c, with var. *clarovittata* (p. 370). *Balanus amaryllis* forma *euamaryllis* Broch, 1922 : 321; 1931 : 66; NILSSON-CANTELL, 1932 : 10; 1934a : 68; 1934b : 58; 1938 : 46; DANIEL, 1956 : 6, figs. 17-21.

*Chirona amaryllis* : NEWMAN and ROSS, 1976. : 50.

**MATERIAL** : Ci 23, MNHN, Paris. 6 specimens collected from Madagascar, N. W. Coast, off Ambaro bay. Depth 5 m. Bottom : coral and seaweed. 20.11.1959. — Ci 24, MNHN, Paris. 1 specimen collected from Madagascar, South coast, off Ambavombe. Depth 40 m. Bottom : sand and shell. 1958.

#### REMARKS

The plates bear purple and pink longitudinal stripes; the spur of the tergum is narrow and long, with the median furrow deep and narrow or obscure. The lower part of the cutting edge of the maxilla I is prominent. By these features, the present species may easily be distinguished from all other species of the genus *Chirona*.



Measurements of largest specimen : carino-rostral diameter : 28.2 mm, height : 29.5 mm.

DISTRIBUTION : China, Japan, Philippines, Malay Archipelago, Australia, East Africa and Indian Ocean.

## 21. *Chirona tenuis* (Hoek, 1883)

*Balanus tenuis* Hoek, 1883 : 154, pl. 13, figs. 29-33; 1913 : 190, pl. 17, figs. 14-19, pl. 18, fig. 1; GRUVEL, 1905 : 247, fig. 275; PILSBRY, 1916 : 216; BARNARD, 1924 : 74; NILSSON-CANTELL, 1925 : 34, fig. 13, pl. 1, figs. 5-6; 1927 : 785; 1938 : 46; BROCH, 1931 : 70; HIRO, 1937 : 439, fig. 24; UTINOMI, 1962 : 216; 1968 : 174; 1969 : 88, fig. 6; UTINOMI and KIKUCHI, 1966 : 6; REN and LIU, 1978 : 161, fig. 22, pl. 7, figs. 6-10.

*Balanus albus* Hoek, 1913 : 185, pl. 16, figs. 12-13, pl. 17, figs. 1-6; STUBBINGS, 1936 : 41, fig. 18. *Chirona tenuis* : NEWMAN and ROSS, 1976 : 50.

MATERIAL : Ci 2087, MNHN, Paris. 2 specimens attached to shell. Madagascar, 12°52.1'S, 48°10.1'E. Depth 403-415 m. 4.03.1971. — Ci 2088, MNHN, Paris. 3 specimens attached to shell. Madagascar, 12°42.2' S, 48°14.2' E. Depth 395-405 m. 14.04.1971. — Ci 2089, MNHN, Paris. 1 specimen attached to shell. Madagascar, 12°38.5' S, 48°16.5' E. Depth 240 m. 11.10.1974. — Ci 2090, MNHN, Paris. 1 specimen attached to a piece of echinoid. Madagascar, 12°27.7' S, 48°12.5' E. Depth 600-605 m. 19.01.1972. — Ci 2091, MNHN, Paris. 5 specimens attached to small piece of echinoid. Madagascar, 12°43' S, 48°15' E. Depth 348-360 m. 14.04.1971. — Ci 2092, MNHN, Paris. 2 empty shells attached to shell of Gastropoda. Madagascar. — Ci 2093, MNHN, Paris. 5 specimens attached to pieces of echinoid. Madagascar, 12°43' S, 48°15' E. Depth 348-360 m. 14.04.1971.

### REMARKS

19 specimens were collected from depths of 240-605 m.

The shell is tubulo-conical, solid and white with semitransparent longitudinal stripes. The radius is narrow. The growth ridges of the scutum are cut by longitudinal grooves. The spur of the tergum is wide and short, the end often with small spines. The cutting edge of maxilla I is straight.

Measurements of largest specimen : carino-rostral diameter : 24.0 mm, height : 20.3 mm.

DISTRIBUTION : China, Japan, Philippines, Malay Archipelago, Indian Ocean and South Africa.

## Genus **SOLIDOBALANUS** Hoek, 1913

### 22. *Solidobalanus ciliatus* (Hoek, 1913)

(Fig. 13)

*Balanus ciliatus* Hoek, 1913 : 199, pl. 19, figs. 8-16; NILSSON-CANTELL, 1925 : 38, fig. 14, pl. 1, fig. 7; 1934a : 68, fig. 7, pl. 5, fig. 7; 1934b : 59; 1938 : 49, pl. 1, fig. 6, pl. 2, fig. 1; BROCH, 1931 : 7; 1947 : 6; STUBBINGS, 1936 : 43; ZULLO and NEWMAN, 1964 : 168; UTINOMI, 1969 : 90; REN and LIU, 1978 : 168, fig. 26, pl. 8, figs. 16-23.

*Solidobalanus (Solidobalanus) ciliatus* : NEWMAN and ROSS, 1976 : 50.

MATERIAL : Ci 18, MNHN, Paris. 57 small specimens attached to bark. Madagascar, S. E. Coast, off Fort-Dauphin. Depth 60 m. Bottom : sand and shell. October 1958. — Ci 20, MNHN, Paris. 1 specimen.

Madagascar, S. E. Coast, off Ste Luce. Depth 50 m. Bottom : sand and shell, sponges and hydroids. October 1958.

REMARKS

The shell is low, conical, slightly laterally compressed, whitish or pinkish, with stripes or flecks of darkish pink or pinkish-purple on the paries, radii and opercular valves. The rostrum is usually slightly coloured or white. The radii and alae are well developed, broad, with slightly oblique summits. The scutum is narrowly triangular, with an acute apex; the lower end of the articular ridge is obliquely truncated; without adductor ridge, the adductor pit is shallow, the depressor muscle pit is deep. The tergum is narrow, in younger individuals the spur is rather pointed, in older ones, more rounded, with small tooth-like projections. The crests for the lateral depressor muscle are distinct.

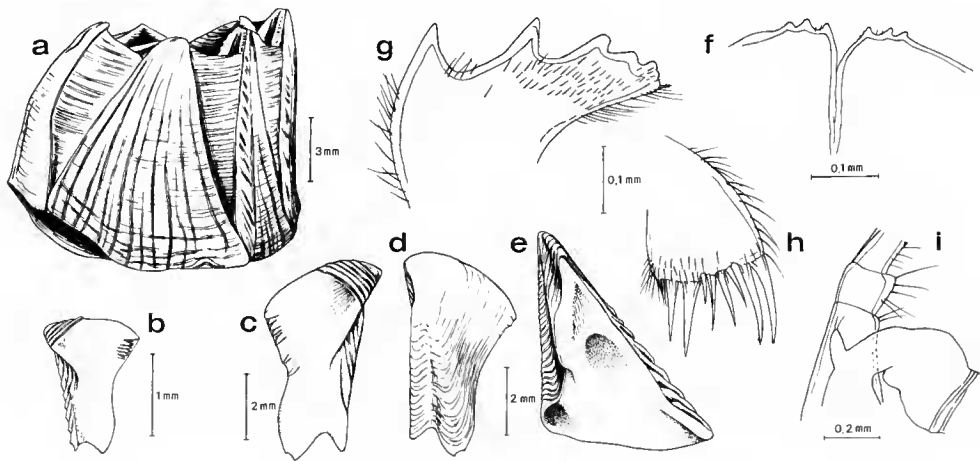


FIG. 13. — *Solidobalanus ciliatus* (Hoek) : a, shell; b, c, d, tergum; e, scutum; f, labrum; g, mandible; h, maxilla I, i, basal part of penis and cirrus VI.

The labrum has 3 teeth on each side of the deep median notch. The mandible has 5 blunt teeth. The cutting edge of maxilla has a small notch and 7 spines. Cirri IV-VI are with 3-4 pairs of setae on the anterior margin of each segment. The penis bears a basi-dorsal point, the end of which has 2 fine setae.

In HOEK's description, the species is more or less distinctly orange-coloured. But NILSSON-CANTELL (1934) has shown that it may be a variable character, because he found specimens also with white radii. The present specimens correspond with NILSSON-CANTELL's description. The species is very similar to *Solidobalanus fallax* (Broch), from Atlantic coast of Africa, in general feature and colour. The latter may be synonym of this species.

DISTRIBUTION : East and South China Sea, Japan, Philippines, Malay Archipelago, Indian Ocean.

Genus *ACASTA* Leach, 1817

23. *Acasta crassa* Broch, 1931

(Fig. 14)

*Acasta crassa* Broch, 1931 : 109, fig. 37.

MATERIAL : Ci 2094, MNHN, Paris. Madagascar, 12°40.2' S, 48°18.0' E. Depth : 185-190 m. 1.08.1973.

REMARKS

Of this species, only one dried specimen is described.

The shell is conical, the outer surface of the compartments is yellowish in colour, with transverse stripes, the radii and basis are whitish. The lower parts of the compartments have a few small calcareous thorns. The rostrum is low and arched; the carina is high. The carinolateral reaches one third the breadth of the lateral. The radius is broad, with transversal and longitudinal striae, the summits oblique. The ala are broad, with slightly oblique summits. The orifice is small and dentate. Below the sheath, the inner side of the compartments is smooth, the lower part with indications of longitudinal ribs, but without longitudinal tubes within the plate. The basis is cup-shaped and irregular, with transverse striae.

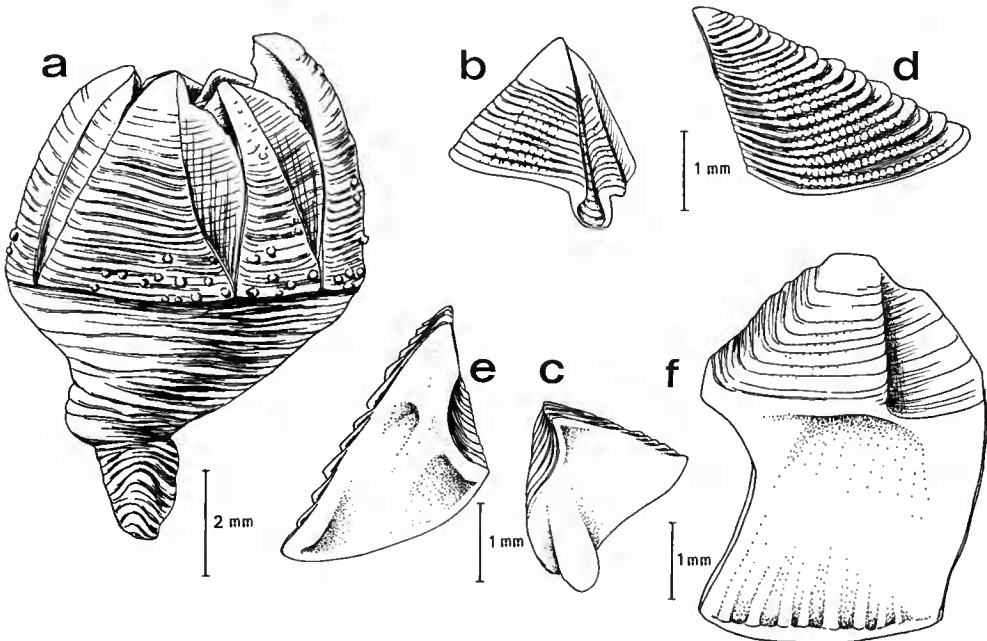


FIG. 14. — *Acasta crassa* Broch : a, shell; b, c, tergum; d, e, scutum; f, inner side of lateral plate.

The scutum is thick and broad, the growth ridges prominent and clearly cut and not traversed by radiating striae; the adductor ridge is about half as long as the tergal margin or smaller; the adductor and lateral depressor pits are deep. The tergum is quadrangular in shape, with growth ridges as on the scutum. The spur is short and rounded; the median furrow deep and rather broad. The plate is thicker, its inner side smooth, with the spur area somewhat raised; crests for the depressor muscle indistinct.

The present specimen corresponds closely to BROCH's description, but the carinae are slightly arched and the rostrum is almost straight.

Measurements: carinorostral diameter: 7.0 mm, lateral diameter: 6.0 mm, height of carina: 5.0 mm, depth of basis: 5.0 mm.

DISTRIBUTION: Saparua Bay, Moluccas; Madagascar. The species is now recorded from the first time from Madagascar waters.

#### 24. *Acasta madagascariensis* sp. n.

(Fig. 15)

HOLOTYPE: Ci 2095, MNHN, Paris. Carinorostral diameter 15.2 mm, lateral diameter 12.6 mm, height of carina 17.0 mm. Off north west coast of Madagascar, 12°55.2' S, 48°28.2' E. Depth 42 m; in Demospongia. 2.08.1973.

PARATYPES: Ci 2096, MNHN, Paris. 5 specimens. Same as the holotype.

OTHER MATERIAL EXAMINED: Ci 15, MNHN, Paris. 5 specimens (2 kept at IOAS). Madagascar, N. W. coast, off Mitsio Islands. Depth 40 m. Fine sand, in Demospongia. February 1960. — Ci 2102, MNHN, Paris. 1 specimen. Madagascar, W. coast, Pracel Shoal. June 1959.

#### DESCRIPTION

Shell globose, white, pale pink or flesh in color. Surface of compartment with small calcareous projection. Orifice large. Radius very wide, wider than associated parietes, with transverse and longitudinal stripes, summits oblique. Ala broad. Carinolateral about 1/2-1/4 as wide as lateral. Sheath of compartment about 1/3 as long as plate, with transverse growth lines; basal margin suspended. Lower part of inner surface of plate with longitudinal ribs below sheath. Basis rather small and flat.

Scutum long, narrow, growth ridges crossed with traces of fine longitudinal groove. Articular ridge low, long, transversally cut at lower end; articular groove narrow, shallow; adductor ridge absent; adductor pit large; lateral depressor pit deep or shallow. Tergum narrow, long, with distinct growth lines, median furrow broad and shallow, articular ridge low, articular groove broad, basal margin of plate extended downward to carinal margin of spur. Spur broad, with end obliquely truncated.

Labrum with 3 teeth on each side of median notch. Mandible with 4 teeth, lower angle irregular. Cutting edge of maxilla I straight, without notch, with 10-11 medium-sized spines between upper and lower pairs of large spines.

Numbers of segments in cirri as follows :

I	II	III	IV	V	VI
21    13	17    13	27    22	38    41	35    44	43    43

Anterior ramus of cirrus I twice as long as posterior. Protopodite of cirrus IV without teeth. 8-28 segments of anterior ramus with erect small teeth on disto-ventral corner. Cirri IV-VI with 3-5 pairs of setae present on anterior margin of each segment in middle portion. Penis longer, with basidorsal point, annulate.

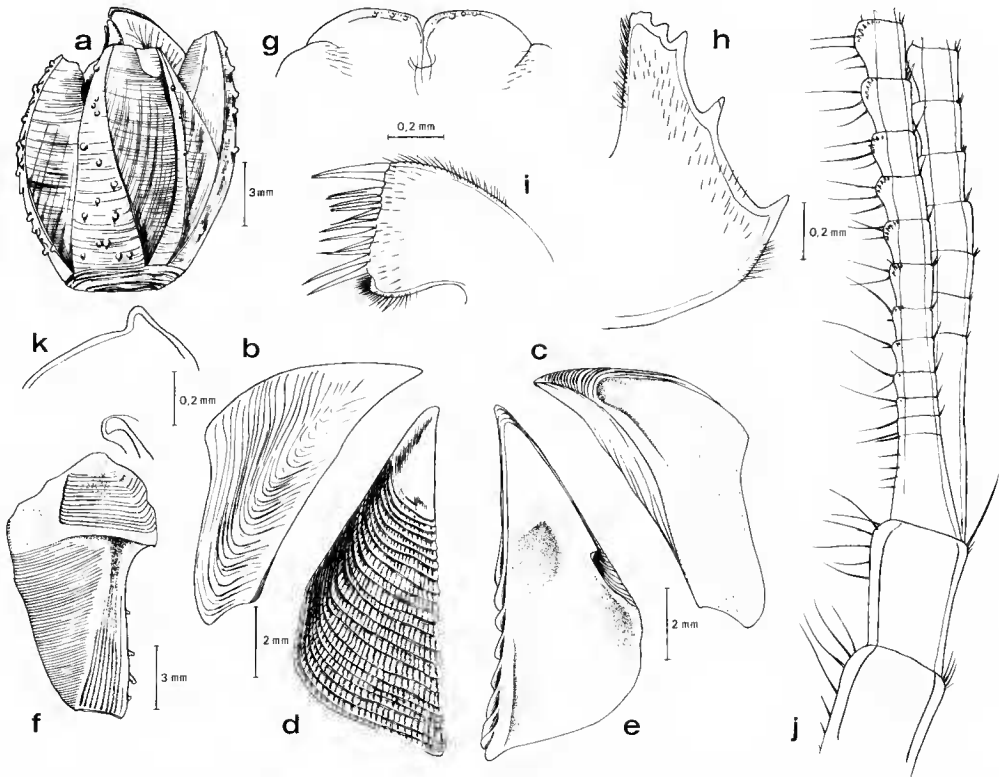


FIG. 15. — *Acasta madagascariensis* sp. n. : a, shell; b, c, tergum; d, e, scutum; f, lateral plate; g, labrum; h, mandible; i, maxilla I; j, cirrus IV; k, basidorsal point of penis.

#### REMARKS

This new species is very similar to *Acasta cythus* Darwin in shape, but may easily be distinguished from the latter by the articular ridge of scutum being transversally incised at the lower end; the segments of the anterior ramus of cirrus IV without downward curved mandible-like teeth and the labrum with 3 teeth on each side of the median notch.

Family BALANIDAE Leach, 1817

Genus **BALANUS** Da Costa, 1778

25. **Balanus amphitrite amphitrite** Darwin, 1854

(Fig. 16)

*Balanus amphitrite* var. (1) *communis* Darwin, 1854; 240 (part).

*Balanus amphitrite* forma *hawaiiensis* Broch, 1922 : 314, fig. 56 (part).

*Balanus amphitrite* var. *denticulata* Broch, 1927 : 133, fig. 14.

*Balanus amphitrite amphitrite* : HARDING, 1962 : 274, pls. 1-2; UTINOMI, 1967 : 200, pl. 6, fig. 1; HENRY and McLAUGHLIN, 1975 : 30, figs.; NEWMAN and ROSS, 1976 : 62; REN and LIU, 1978 : 133, figs. 7-9, pl. 3, figs. 1-9.

MATERIAL : Ci 13, MNHN, Paris. 14 specimens attached to shell, together with *Balanus rhizophorae* nom. n. (= *B. littoralis* Ren and Liu). Madagascar, N. W. Coast, off Nosy Be. Mangrove. December 1958.

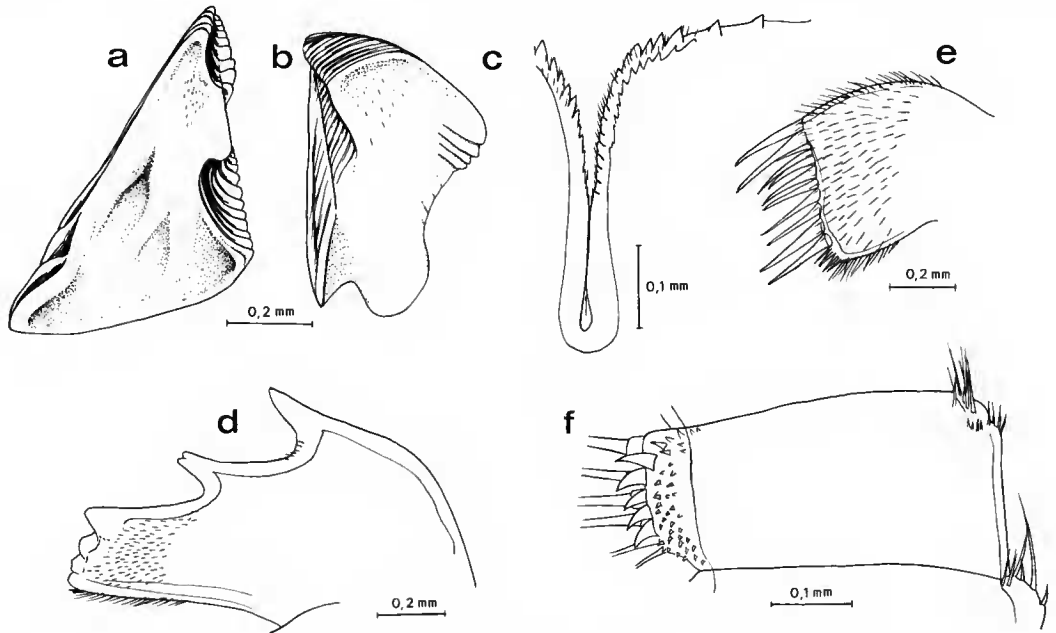


FIG. 16. — *Balanus amphitrite amphitrite* Darwin : a, scutum; b, tergum; c, labrum; d, mandible; e, maxilla I; f, ninth segment of outer ramus of cirrus III.

REMARKS

The specimens are conical, with dark purple longitudinal stripes, the radius is broad with level or slightly oblique summits. The scutum has a prominent adductor ridge and adductor

pit, the lateral depressor pit is shallow. The tergum has a short and broad spur, the end bluntly rounded. The labrum has many teeth on each side of the median notch.

Measurements of largest specimen : carino-rostral diameter : 15.6 mm, height : 9.0 mm.

DISTRIBUTION : Cosmopolitan, in warm and temperate seas.

26. *Balanus rhizophorae* Ren and Liu, nom. nov.

(Fig. 17)

*Balanus littoralis* Ren and Liu, 1978 : 148, fig. 16, pl. 5, figs. 7-17.

MATERIAL : Ci 2097, MNHN, Paris. 5 specimens together with *Balanus amphitrite amphitrite* Darwin. Madagascar, N. W. coast, off Nosy Be. Mangrove. December 1958.

REMARKS

The shell is conical, light greyish brown with darkish purple longitudinal stripes. The radius is narrow, with oblique summits. The ala are broad. The scutum is narrowly triangular, the outer surface slightly convex, with purple longitudinal stripes on the tergal side, the articular and adductor ridges long. The tergum is broad, with 5 crests for the lateral depressor muscle. The spur is long, the end slightly acute.

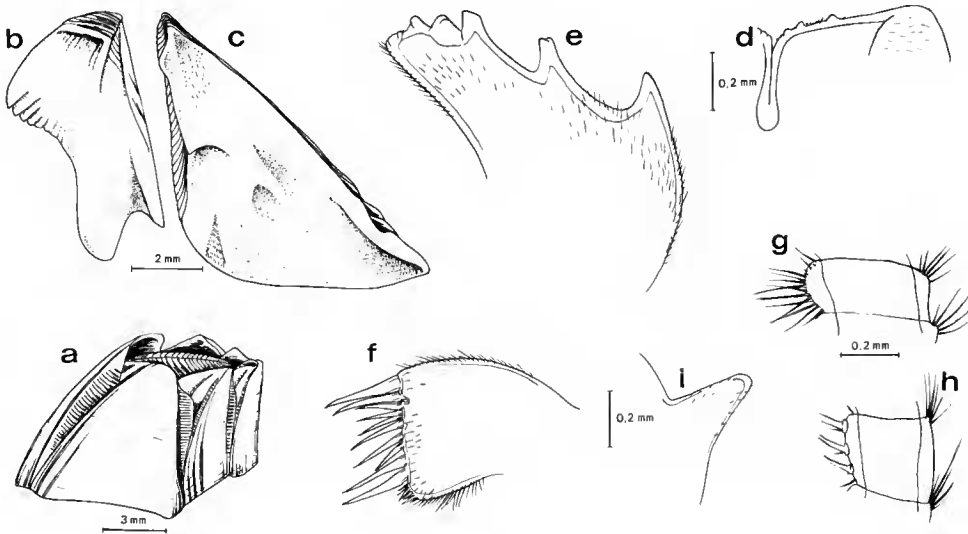


FIG. 17. — *Balanus rhizophorae* Ren et Liu, nom. nov. : a, shell; b, tergum; c, scutum; d, labrum; e, mandible; f, maxilla I; g, ninth segment of outer ramus of cirrus III; h, twenty-first segment of outer ramus of cirrus IV; i, basi-dorsal point of penis.

The labrum has 3 teeth on each side of the median notch. The mandible has 5 blunt teeth. The cutting edge of the maxilla bears 10 spines. The cirrus III is without pectinate setae. The penis has the basi-dorsal point covered by fine setae.

The present specimens agree well with the description given for *Balanus littoralis* by REN and LIU (1978), collected from the South China Sea. Because the name *Balanus littoralis* has been used by KOROSVÁRY for his *Balanus amphitrite littoralis* Korosváry, for the present species, a new name is proposed : *Balanus rhizophorae* Ren and Liu, nom. nov.

Measurements of largest specimen : carino-rostral diameter : 18.0 mm, height : 11.0 mm.

DISTRIBUTION : South China Sea, Indian Ocean. The species is recorded for the first time from Madagascar.

### Genus MEGABALANUS Hoek, 1913

#### 27. *Megabalanus tintinnabulum tintinnabulum* (Linnaeus, 1758)

(Fig. 18 a-b)

*Lepas tintinnabulum* Linnaeus, 1758 : 668; KRÜGER, 1911 : 46.

*Balanus tintinnabulum* var. (1) *communis* Darwin, 1854 : 195, pl. 1, figs. a, b, f, *supra*, pl. 2, figs. 1a, 1c, 1d, 1e, 1i, 1k.

*Balanus tintinnabulum* var. *communis* : GRUVEL, 1905 : 211, figs. 230, 231.

*Balanus tintinnabulum tintinnabulum* : PILSBRY, 1916 : 55, pl. 10, fig. 1-1e; BARNARD, 1924 : 66; NILSSON-CANTELL, 1931 : 108; 1938 : 33; HIRO, 1939 : 258, fig. 7; OLIVEIRA, 1941 : 11, pl. 4, fig. 1, pl. 2, fig. 1-2, pl. 8, fig. 6, pl. 5, fig. 3; MOORE 1944 : 333; TARASOV and ZEVINA, 1957 : 163, fig. 8; ZEVINA and TARASOV, 1963 : 87, fig. 8; STUBBINGS, 1961 : 20; 1963; 13; REN and LIU, 1978 : 121, fig. 1, pl. 1, figs. 1-5.

*Megabalanus tintinnabulum* : NEWMAN and ROSS, 1976 : 68.

MATERIAL : Ci 22, MNHN, Paris. 2 specimens collected from Madagascar, S. E. coast, off Ste Luce, intertidal zone. May 1960.

#### REMARKS

The outer surface of the specimens is corroded, but the basal part is coloured with distinct purple longitudinal stripes and the tergum is slightly narrow in width.

Measurements of largest specimens : carino-rostral diameter : 37.6 mm, height : 51.8 mm.

DISTRIBUTION : West Africa from Mediterranean to Cape of Good Hope, Europe, East Mediterranean, Madagascar, Arabian Sea, Bay of Bengal, Thailand, East and South China sea, Japan, New Zealand, Brazil, Venezuela.



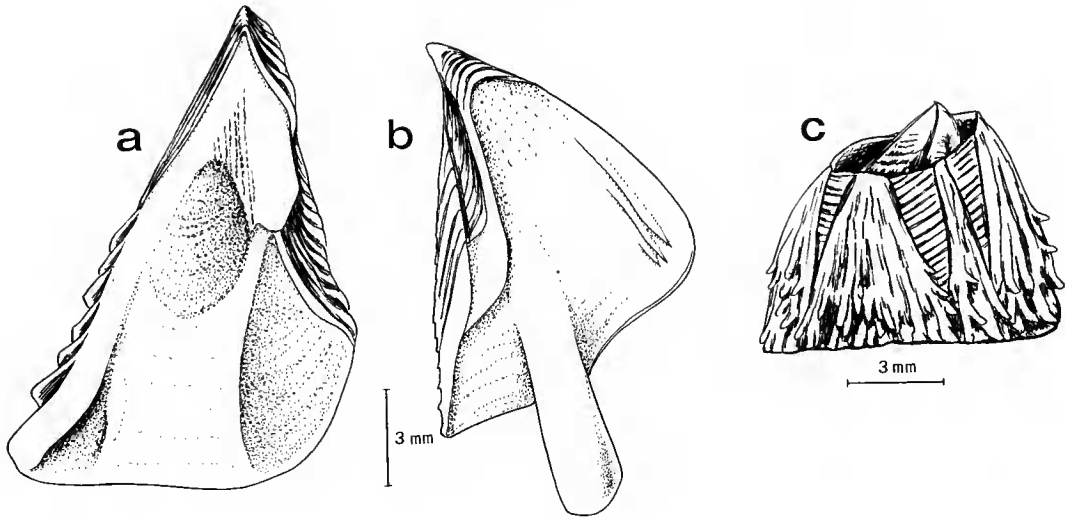


FIG. 18. — a-b, *Megabalanus tintinnabulum tintinnabulum* (Linnaeus) : a, scutum; b, tergum. — c, *Megabalanus volcano* (Pilsbry), shell.

## 28. *Megabalanus volcano* (Pilsbry, 1916)

(Fig. 18 c)

*Balanus tintinnabulum volcano* Pilsbry, 1916 : 60, pl. 11, figs. 2-2e; NILSSON-CANTELL, 1932 : 19, fig. 7; 1938 : 34; HIRO, 1937 : 430, fig. 19a; 1939 : 208; TARASOV and ZEVINA, 1957 : 165; UTINOMI, 1969 : 21; 1970 : 350, pl. 18, fig. 6.

*Balanus tintinnabulum occator* : ZEVINA, 1963 : 89, fig. 9.

*Balanus (Megabalanus) volcano* : YAMAGUCHI, 1973 : 115; REN and LIU, 1978 : 125, fig. 3, pl. 1, figs. 6-16.

*Megabalanus volcano* : NEWMAN and ROSS, 1976 : 69.

**MATERIAL** : Ci 2098, MNHN, Paris. 2 small specimens attached to *Megabalanus tintinnabulum tintinnabulum* (Linnaeus). Madagascar, S. E. coast, off Ste Luce, intertidal zone. May 1960.

### REMARKS

The specimens are conical in shape, with spines and purple longitudinal stripes on the surface of the plates; growth ridges on scutum are armed with small spines.

Measurements of largest specimen : carino-rostral diameter : 14.0 mm, height 9.8 mm.

**DISTRIBUTION** : East and South China Sea, Japan, Indian Ocean. The species is recorded for the first time from Madagascar.

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